HAND-BOOK

OF

SARATOGA,

AND

STRANGERS' GUIDE.

BY

R. L. ALLEN, M. D.

"He sendeth the springs into the valleys, which run among the hills."—Psa. civ. 10.

ALBANY, N. Y.:
J. MUNSELL, 82 STATE STREET
1866.

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INTRODUCTION.

I HAVE been repeatedly solicited to prepare a popular work on the mineral fountains of Saratoga Springs, and to point out the places of interest within the limits of the county of Saratoga. This I have endeavored to do, and the work is respectfully submitted to the public, by the

AUTHOR.

SARATOGA SPRINGS, 1859.

INTRODUCTION TO THE SECOND EDITION.

The first edition of the Hand Book is exhausted, and its author has been urged to publish a second. He has done so, having added a few facts concerning the Geology of the county, the probable origin of the mineral water, and a brief history of the excavations and tubing of the fountains most recently introduced to public notice.

AUTHOR.

SARATOGA SPRINGS, 1866.

HAND-BOOK OF SARATOGA.

CHAPTER I.

SARATOGA.—This is an Indian word of the Iroquois language, and the inflections *oga* and *aga* are local phrases and mean place* or "inhabitants of."† And in the same sense the inflection *aga* is used in the words On-ond-aga and Sac-and-aga. But what meaning the Indians attached to the inflections *Sar-at* or *Sar-agh*, in the word Sar-at-oga or Sar-agh-oga, we have not been able to learn. We know of the locality to which they applied the word Saraghtoga, that it was a tract of land lying from forty to fifty miles north from Albany, on the west bank of the Hudson river.‡

There was doubtless a significancy in the name, for the region was held in high estimation by its immediate occupants, and its merits were not unknown to surrounding tribes, as its traditionary history, so far as it has been discovered, fully assures us; and as is also shown by the public proceedings which were had in reference to it, during the early settlements of the country.

This peculiar tract of country, which was of so

* Henry R. Schoolcraft's letter to the author.

† Stone's Life of Johnson.

‡ Documentary History of N. Y., vol. i,, p. 156.

much importance to a people in a primitive state of of society, lost none of its great value by being transferred to an enlightened nation. Wild forests spread over a varied landscape, consisting of table-lands, which sloped gently toward the banks of the rivers; while mountain ridges raised their bold fronts in the distant background, and gave origin to the multiplied rivulets, creeks, and streams, which traverse the whole face of the country, often spreading into lakes which as so many eyes in the face of the landscape, imparted life and beauty to its features.

Such a country as this could not but be well calculated to supply with food a race of men like the Indians of North America.

The mountain ranges and table-lands were well supplied with moose, deer, wolves, bears, foxes, rabbits, and birds; the rivers also furnished a great variety of fish and water fowl; and the productive soil gave them ample returns for all the seed committed to its bosom. With little care, therefore, and only pleasurable exertion, were the Indians of this region furnished with food, in an abundance and variety not undesirable to civilized man of the present period. So also the pelts of the deer, the wolf, the fox, and the bear, furnished ample protection for their persons, against the greatest severities of this climate.

On the introduction of civilized man to these wilds, they were found to be no less adapted to his wants and necessities, than they had been to his savage predecessors. They furnished him as much food as they had previously done the Indian; and in addition he made of the

rivers highways, by means of which he penetrated the interior of the country, and gathered up the rich furs and skins which were so abundant throughout this wide domain, which he bore away to the great marts of trade in his little water craft; on his return trip loading his boat with all kinds of implements and food necessary for the white man, but which were not supplied in the interior. Thus all the appliances necessary for the development of the country soon found their way along the rivers far into the interior of the forest. And the waterfalls which had so long remained undisturbed, rapidly became active agents in reducing this immense country from its wilderness state to the fit habitation of a civilized people.

When the agriculturist first made his investments in this new country, we find he selected the very sites which had been previously occupied by the aboriginal inhabitants. And the wild forests which supplied the Indian with objects of the chase, furnished the civilized man with the variety of lumber necessary to construct his houses, enclose his farms, and build his ships. These facts remind us that the real wants of man in the different conditions of society, are to be supplied from the same source, and perhaps, after all, are not so very unlike as some persons may be willing to believe.

EARLY SETTLEMENT.—In the year 1687, the French in Canada had collected six or seven hundred Indian warriors about them for the purpose of religious instructions, and to increase their military strength. It was as an inducement for these Indians to leave their new allies

on the bank of the St. Lawrence, possess themselves of the rich plains of Saratoga, and thus make themselves allies of England instead of France, that Gov. Dongan obtained and tendered to them this tract of land, at that time owned by a gentleman in Albany, to whom it had been secured by patent;* a result very desirable to the English interest at that time.

Settlements were made by the whites from time to time, along the banks of the rivers, and the shores of the lakes, lying between the bay of New York and the rich bottom-lands in the valley of the St. Lawrence. The English settlements were made as far up the river as Lydius, now Fort Edward, in Washington county, where they constructed a fort, built saw-mills, and manufactured lumber of various kinds. They had also supplied themselves with goods, provisions, and cattle, which were rarely to be obtained by the early settlers in North America. This prosperity was to be of short duration. In 1742, information was conveyed by one of M. Picquet's detachments, that the English were pushing their settlements up to Lake St. Sacrâment, and at the same time were making warlike preparations at "Sarasto."†

The French general, on receiving this information, dispatched a body of troops under the command of M. Marin, accompanied by Father Picquet. This detachment fell upon the settlement, burnt the fort at Lydius, and several saw-mills, with the timber attached; took the stock of supplies and all the cattle which they found, along fifteen leagues of settlement, and one hundred and

* Documentary History of N. Y., vol, i., p. 155.
† Saratoga.

forty-five prisoners, without having a single French soldier killed or wounded.*

Sir William Johnson writes to the board of trade, that he is building a fort on Lake St. Sacrament, but which he will call Lake George, not only in honor of his majesty, but to establish the dominion of the king.† "I received," says Gov. Clinton, "an account, on the 19th inst., by express from Albany, that a party of French and their Indians had cut off a settlement in this province called Saraghtoge, about fifty miles from Albany, and that about twenty houses with a fort were burnt to ashes, thirty persons were killed and scalped, and about sixty were taken prisoners."‡

This campaign prevented farther efforts at settlement until after the conclusion of peace between the French and English, in 1748.

Patents were granted at an early day by the sovereign of Great Britain. One of the earliest grants of this kind was the Van Schaick patent, which included the present town of Waterford. The Saratoga patent was the next in order of time, and contained a tract of land six miles square, and lying on the banks of the Hudson river, north of Van Schaick's patent. The Apple patent was granted to William Apple, and lay along the Mohawk river, extending "three miles back into the woods." But the most important grant which was made in this section of country was the Kayaderosseras patent, which was granted to thirteen individuals, and embraced a

* Documentary History of N. Y., vol. i., p. 429.
† London Documents, xxxi., p. 178,
‡ London Documents, xxvii., pp. 87, 235, 30th Nov., 1745.

large proportion of the tract now lying within the limits of Saratoga county.

On the 26th of August, 1702, a grant of land was executed by "Te-yon-nin-ho-ge and De-ron-oeh-rak-has, Maquas Indians, owners and native proprietors of the land," to David Schuyler and Robert Livingston, junior, citizens of Albany.

Samson Shelton Broughton, Esq., bought for himself and company a license to purchase the tract of vacant and unappropriated land in the county of Albany, called Kayaderosseras, "adjoining to the north bounds of Schenectady, on the east side thereof, to the west bounds of Saratoga, on the north side thereof, and to Albany river, on the west side thereof, of the native Indians and proprietors thereof, for their cultivation and improvement. Ap. 22d, 1703."

On the sixth of October, 1704, in pursuance of the above-mentioned license, a purchase was effected by Samson Shelton Broughton, Esq., Attorney-General of the Province, Peter Fauconnier, Esq., late Commissioner of the Customs, and Nanning Hermanse Visher, of the city of Albany, mariners, for themselves and the company, of the Indians, Joseph Hendrick, Cornelius, Gideon and Ames, native Maquas Indians and Sachems, in behalf of themselves and all their nation, in consideration of the sum of sixty pounds ($150), current money of the Province of New York, and of sundry goods to them paid in hand.

In the year 1683, the county of Albany was organized. At this date Albany embraced all the territory of New York, lying north of Ulster on the west, and Dutchess

on the east side of the Hudson river. During the continuance of this jurisdiction four townships were organized north of the Mohawk, and west of the Hudson river, viz.: Halfmoon, Stillwater, Saratoga, and Ballston. Eighty-five years after the organization of the county of Albany, there were but ten counties in the State of New York, viz: New York, Westchester, Dutchess, Orange, Ulster, Albany, Richmond, Kings, Queens and Suffolk.

In the year 1791, or one hundred and eight years after the organization of the county of Albany, the county of Saratoga was taken from that part of Albany county lying north of the Mohawk and west of the Hudson rivers. Its greatest length from north to south is forty miles, and its greatest width from east to west is twenty-eight miles. It lies between 42° 46′, and 43° 23′ north latitude, and 3° 21′ and 2° 47′ east longitude from Washington, and contains eight hundred square miles. It is bounded on the north by the Hudson river and the county of Warren; on the west by the counties of Franklin, Montgomery, and Schenectady; on the south by Schenectady county, and the Mohawk river, which separates it from the county of Albany, and on the east by the Hudson river, which separates it from the counties of Rensselaer and Washington.

This county is now divided into twenty townships; the names of each, and the date of their respective organizations, are as follow:

BALLSTON, organized in the year 1788. The first settlement was made in this town in 1763, by two brothers of the name of McDonald. The town derives its name

from the Rev. Eliphalet Ball, who, with a number of his congregation, from Bedford, Westchester county, settled about two and a half miles south of the springs. Ballston Centre, East Line, Burnt Hills, and South Ballston have post-offices.

HALFMOON, lying on the Hudson, was organized in 1788. Crescent, Halfmoon, and Mechanicsville, have post-offices.

SARATOGA and Stillwater were organized also in 1788. Saratoga has a river margin on the east, the beautiful Lake of Saratoga on the west, and the winding stream of Fish Creek coursing its way from the shores of the lake to the banks of the Hudson at Schuylerville; these, with its undulating surface and productive soil, make it one of the most interesting townships in Saratoga county. Schuylerville was the residence of General Schuyler, whose mansion and surrounding buildings were destroyed under General Burgoyne in 1777. The place where General Burgoyne surrendered his sword to General Gates is said to be a short distance north of the site of the old Schuyler mansion, on which stands the dwelling-house now occupied by George Strover, Esq. Coveville, Dean's Corners, Grangerville, Schuylerville, Quaker Springs, and Victory Mills, have post-offices.

STILLWATER is also on the west bank of the Hudson river, and south of Saratoga. The village of Mechanicsville is situated partly in this town and partly in Halfmoon. About four miles above Mechanicsville, and on the Champlain canal, is Stillwater village. In this town are Bemis Heights, the scene of the engagement between Burgoyne and General Gates, in 1777, so

famous in Revolutionary annals, and on which hung results so important in their bearing upon the great struggle between Great Britain and her Colonies. Mr. J. Walker's house is two and a half miles from Patterson's tavern, and two miles from the Hudson river. A few rods south of this house is the "meadow" on which General Frazer fell, mortally wounded; it is a little west of the road which now runs north and south directly past the place. Near the spot where Frazer fell, is the common grave of forty soldiers, whose bodies were committed to their final resting-place after the engagement. But about sixty rods in a southwest direction was the scene of the main action, which occurred on the 7th of October, 1777. The post-offices are Bemis Heights, Ketchum's Corners, and Stillwater.

CHARLTON.— In the year 1792, Charlton, Galway, and Milton, were taken from Ballston and organized as townships in Saratoga county. Charlton has post-offices at Charlton and West Charlton.

GALWAY has East Galway, Galway, Mosherville, Whiteside's Corners, North Galway, and South Galway, as post-offices.

MILTON, Rock City Mills, West Milton, and Ballston. The latter is the county-seat of Saratoga county. It was incorporated in 1807. The village is situated thirty miles north from Albany, twenty-four from Troy, fifteen from Schenectady, and seven south west from Saratoga Springs. The village of Ballston is situated in a valley, and is built on either side of the small stream which is a branch of the Kayaderosseras creek. Within the limits of the village are the Mineral

fountains, some of which at one time had a high reputation for their medicinal qualities; and large numbers of strangers annually resorted to them for their healing virtues. But, from the nature of one of the substrata which underlie the village, and through which its mineral water percolates, it has been found difficult to secure it at all times in its best forms, and consequently the springs of this pleasant village, which, in times past, were so justly celebrated, have ceased to be used either at the fountains or for bottling. It is well supplied with churches and hotels; and the fact that it contains *the* public buildings of the county, adds not a little interest to the village.

The mineral fountains in this village were discovered in the year 1767. In 1772, an individual by the name of Douglass built a log house for the accommodation of strangers who resorted hither for the benefit of the mineral water. During the Revolutionary War, the farther developments of the town were suspended; but about the year 1790, Mr. Douglass enlarged his former accommodations for the increased number of strangers.

In 1804, Nicholas Low erected the present Sans-Souci hotel; it is built of wood, is three stories high; main building one hundred and sixty feet long, and wings one hundred and fifty feet.

GREENFIELD was taken from Saratoga and Milton in 1793. West Greenfield, Greenfield Centre, Porter's Corners, North Greenfield, Mount Pleasant, and Middle Grove, have post-offices.

PROVIDENCE was organized in 1796. It was taken from the town of Galway. Providence, West Providence, and Barkersville, have post-offices.

NORTHUMBERLAND is situated on the banks of the Hudson river. It was taken from Saratoga in 1798. Gansevoort and Northumberland are the post-offices.

EDINBURGH and Hadley were organized in 1801. The former was taken from Providence, and has post-offices at Edinburgh and at Batchelorville. The latter was taken from Greenfield and Northumberland, and has post-offices at Hadley and West Hadley.

In 1802, MALTA was taken from Stillwater. Maltaville and Malta have post-offices.

Moreau is a pleasant and flourishing township lying on the banks of the Hudson river. This stream bounds the town on the northeast and on the northwest. It was taken from the town of Northumberland in the year 1805. Moreau Station, Fortsville, and South Glens Falls, have post-offices.

WATERFORD was organized in 1816. It is pleasantly situated at the confluence of the Mohawk and Hudson rivers. Waterford is a pleasant village, and for many years was the business village of the county; but canals and railroads have diminished its importance, and its trade is now inconsiderable.

In 1818, CORINTH and WILTON were organized. The former was taken from Hadley; Corinth, formerly called Jessup's Landing, is a small village: it and South Corinth have each a post-office; the latter was taken from Northumberland. Wilton has the post-office.

DAY and SARATOGA SPRINGS were organized in 1819. The former was taken from Edinburgh and Hadley, and occupies the northwest part of the county. Day and West Day are the names of its post-offices.

SARATOGA SPRINGS, in the centre of the county, is second to no inland village in the state. Its hotels are spacious and elegant, and its churches are large, commodious, and elaborate in finish. Many of the private residences are handsome, and the number is annually increasing in and about the village, of such as belong to gentlemen who have retired upon their fortunes; but the mineral fountains are the great attraction of the place. They are numerous, but few of them have been so perfectly curbed as to render the water suitable for bottling and exportation. This village is one hundred and eighty-one miles from New York city, and thirty-six and a half from Albany. It is beautifully situated three hundred feet above tide water. The Kayaderosseras mountain, two thousand feet above the level of the sea, raises its summit within ten or twelve miles of the village, on the west and north; while the Green mountains stretch along the eastern horizon at a distance of about twenty miles; the high ranges of the Catskill skirt the extreme south. The surrounding country is well watered; the atmosphere is dry and highly electrified; the climate entirely unlike that of Boston, New York, and the whole seaboard, as those well know, who have been exposed to a sixty days' east wind on our northeastern coasts. The village is very accessible by means of railroads. Its mineral water is *sui generis*. It is an article of commerce, and the civilized world are customers; and many thousands of persons annually bear testimony to its happy medicinal effects, when drunk at the fountains.

CLIFTON PARK was the last town organized in the

county. It was taken from Halfmoon in 1828. Rexford's Flats, Clifton Park, Vischer's Ferry, Jonesville, Groom's Corners, and Dry Dock, are post-offices in this town.

CHAPTER II.

SIR WILLIAM JOHNSON was the first white man who visited these springs, and the first civilized person who applied them as a remedial agent. It is true that Michael McDonald, a Scotchman, who had previously settled at Ballston Lake, was one of Johnson's party, and must have been at the High Rock at the same time with the baronet and his Indian guides; but we have no information of his having previously visited them, although he had settled so near them. And his visit at this time, was at the instance of Johnson, who, with his party, had stayed the previous night at McDonald's house. Johnson's visit was caused by an indisposition, which so far disabled him, that he was unfit to travel over the rude passes which then lay between this and Johnstown. And we are informed that the Indians bore him in a litter from Johnstown, in Montgomery county, along the banks of the Mohawk to Schenectady, and thence, by Ballston lake, to this place, at that time a wilderness. Here he stayed some time, used the water, and so far recovered his health that he returned to Johnstown, by the way of Schenectady, on foot. His cure was attributed, by him and his friends, to the water which he drank from the

High Rock spring. He being a public man, his cure induced other white people from the adjacent settlements to visit the spring, and for themselves, to try its virtue. And the sick and the curious could be very often seen winding their solitary way toward this health-giving fountain, along the trails which led from settlements in old Saratoga, in the vicinity of Snake hill, and back into the wild forest of Palmertown, now the town of Wilton.

So important had these fountains become, in 1773, that one Dirick Scowton was induced to remove to them, clear away a piece of ground, on the top of the hill in the rear of the High Rock spring, and build a log cabin. But before he had completed his rude tenement, he is said to have had a misunderstanding with the Indians who were living about the springs, and found it for his interest and personal safety to abandon his enterprise, which he did accordingly.

In the year 1774, one John Arnold, from the state of Rhode Island, with his family, arrived on the east shore of Saratoga lake. Here he heard such accounts of the mineral springs, and the land about them, that he was induced to continue his journey thus much farther. After having supplied himself with articles suitable for trading with the Indians, he procured a canoe, put on board his family, his little stock in trade, together with provisions and some furniture, and paddled from Snake hill across the lake, and entered the mouth of the Kayaderosseras creek. This stream he followed about two miles, where he landed; and he and his family, taking his goods and household furniture on their backs, entered upon a trail which they followed to the mineral

springs. On arriving here, he took possession of the house previously built by Scowton, and having improved it, opened it as a tavern, and occupied it two summers, leaving it the intervening winter. After the second summer he abandoned it.

Its next occupant was Samuel Norton, who took possession of the house the same season in which Arnold left it, and made farther improvements in it. The following year he cleared and cultivated as well as he could, the land about him. Norton acted under the patronage of Isaac Law, who had previously obtained a title to the land, by purchase from Rip Van Dam. In this purchase Law was associated with Anthony Van Dam and Jacob Walton. The troubles with Great Britain having now commenced, Norton became concerned for the safety of himself and family in their exposed situation; he therefore abandoned the improvements that he had made, united himself with the British army, and soon after died. His death left the springs again without a white inhabitant. Law left the country during the Revolution, and his property was confiscated.

In 1786, Henry Livingston purchased of the commissioners of forfeiture, for himself and brothers, the land and improvements which had previously belonged to Law.

In 1783, a son of Norton removed to the springs, took possession of the property previously occupied by his father, and prosecuted the improvements already begun. until the year 1787, when he sold to Gideon Morgan, who the same year conveyed it to Alexander Bryan, who built a blacksmith's shop, and an additional log house which he opened as a tavern. Bryan, we are in-

formed, was born in Connecticut; at an early day he removed to Dutchess county, in this state, thence to Halfmoon, two miles from Waterford, now in this county, and finally to Saratoga Springs. During the revolutionary struggle he was at Halfmoon, and, strange as it may appear, he is said to have been a favorite with both parties; and so well did he manage the matters of difference, that he became the confidant of both parties, and was employed as a spy by both Gates and Burgoyne. While the latter lay with his forces at Fort Edward, he communicated to General Gates the fact that Burgoyne had crossed the river, and was marching his army toward Stillwater. This information was considered at the time important to the American army. Bryan was the first permanent settler at the springs after the close of the war.

GIDEON PUTNAM, the son of Rufus and Mary Putnam, was born in the town of Sutton, in the state of Massachusetts, in the year 1764. Before his majority he purchased his time of his father for one hundred dollars, and married Miss Doanda Risley at Hartford, Conn., daughter of Benjamin Risley. He immediately set out "to seek his fortune;" his only means of support for himself and wife, being a strong arm and a determined will. The route they took led them to Middlebury, Vt. Here, in the midst of the wilderness they halted, and rudely threw together a log cabin. This cabin was built around a white oak stump which was squared upon the top, and served them as a table; the cabin was without a chimney. Their seats were made with three legs of

wood driven into a piece of timber riven from a log. The site of this cabin is now occupied by the Middlebury college buildings. Their household possessions consisted of three white teacups and saucers, three white plates, "three knives and forks, a dish-kettle, an earthen tea-pot and a spider." They cut out the top of a stump deeply concave, and then mounted a heavy sweep which turned a wooden pestle, fitted to the excavation in the stump. This homely apparatus was the mill in which they ground their grain. There was a "grist-mill" forty miles from them, but a dense forest lay between, and blazed trees pointed out the way. Their oldest child was born at Middlebury. Not finding this situation quite to their minds, they removed to Rutland, Vt. While at Rutland their eldest son Benjamin Putnam was born. From Rutland they removed to the Five Nations, or Bemis Flats. Here they were joined by Dr. Clement Blakesly and his wife, who was a sister of Mrs. Putnam. "The lay of the country, the quality of the soil, and the appearance of the timber" suited him; and at once he put up a cabin, which was occupied by his brother-in-law and himself, with their families, together with a hired man by the name of Elijah Olds. At Bemis Flats the elements warred against them, and proved more than a match for even Putnam's strength and energy. A violent rain-storm falling in the middle of the night, flooded the surrounding country, and drove the hardy pioneers with their wives and little ones, on to their beds, furniture, &c., out of the reach of the water, which covered the cabin floor; without, as far as they could see, was one vast sheet of water. In this

condition was this bold, vigorous, and determined man caged, and unable to extricate himself or his household. Yet in the midst of all this darkness and distress they were thought of and cared for. A good man by the name of Zophar Scidmore, living on the east shore of the lake, knew that some emigrants had commenced a farm on the flats, and being acquainted with the situation of their cabin, he felt sure they must be in suffering, if not dangerous circumstances; he therefore loosed his sail-boat, and taking a light canoe in tow, made all possible haste to their rescue. On nearing the cabin he fastened his sail-boat to some float wood which lay piled upon the bank, and rowed his canoe up to the door of the cabin, and conveyed first Mrs. Putnam and her young child to his sail-boat; after securing them safely, he returned to the cabin for Mr. Putnam, whom he also rowed to the sail-boat. Here Scidmore joined Mrs. Putnam, and conveyed her to his own house. After safely disposing of his passengers, he returned to the flood wood, whither during his absence the remainder of the family had been conveyed in the canoe by Putnam. Reloading his little craft with Mrs. Blakesly, and the other child, he returned to his house; and in the course of the day, he had rescued the whole family, and had them safely lodged under his most hospitable roof. This calamity induced Putnam to abandon his improvements at Bemis Flats, and after the storm was over, he, with his family, and, in company with Dr. and Mrs. Blakesly, left the house of their benefactor, and entered on an Indian trail, which they followed to the Springs, then scarcely known; this occurred in the year 1789.

On arriving at what is now the village of Saratoga Springs, he selected a piece of land, near a fresh-water spring, and built a cabin. This land is now owned by Joel Clement, and the site of the cabin is a few rods to the east of Clement's stone house, in the west part of the village.

On reviewing his position at Saratoga, Putnam said to his wife, "This is a healthy place, the mineral springs are valuable, and the timber is good and in great abundance, and I can build me a *great house*," a desire which had haunted him from childhood. He at once leased three hundred acres of land, girdled the trees about him, and put in his crops, and when he could not work upon his farm, he employed himself and his man Olds, who remained with him for years, in making staves and shingles, which he carried to the Hudson river, at the mouth of Fish creek. The ensuing spring he put them into a raft, and floated them to New York city, where he met with a ready sale, and returned with means to build a saw-mill. On his return to his farm, he found a new neighbor by the name of William Patching, a wheelwright by trade, with whose assistance, he soon had his mill in successful operation, and kept it running night and day. This mill was southwest from his house, and the pond belonging to it has been known to many generations of the boys of the village, and, indeed, is still familiar to the present race, as Put's pond, and has been a favorite swimming-place ever since. Dr. Blakesly built a log-house where Benjamin Putnam for many years afterwards resided. The next spring, Putnam's sawed lumber, added to his staves and shingles, made

him a large raft, which he floated to New York. Building materials being scarce, and the demand for them being great in the city, he obtained a handsome sum for his year's labor. With the funds thus realized, he clothed himself and family, provided a great variety of necessaries, and brought home besides "one peck measure of silver coin," in an old-fashioned pair of saddlebags; with which money he paid for the three hundred acres of land that he had previously held by a lease. But his new garments so changed his personal appearance that his wife did not know him on his return. One fancy article which he brought back with him from his voyage, was a red silk umbrella, which his eldest daughter flourished on the ensuing Sunday. Near the sawmill pond was the Indian-Joe-field, which had been cleared and cultivated by the Indians. This field Putnam used to great advantage, and some of the herbs now growing there are said to have been originally planted on the place by the Indians. This farm is now in the possession of James M. Andrews, Esq.

The third year after Putnam and Blakesly built their cabins on opposite sides of the road, Blakesly left, and Putnam enlarged the cabin built by Blakesly, and occupied it himself. From this cabin Putnam removed back into what is the present village, and occupied for the year, the house now owned by Thadeus Smith,* afterwards moved into a log cabin, which stood upon the spot where the St. Nicholas Hall has been recently built by one of his descendants. While living here, and in the

* This house was destroyed by fire in 1863.

year 1802, he purchased of Henry Walton, one acre of land, removed a few of the primitive trees, and built seventy feet of the present Union Hall*— his mechanics lodging in the attic of the cabin, to which they went up on the outside by a ladder, and their table was set outside. The spot was then in the midst of the forest, and so large a building was a novel thing for the time. A wagon way had been made at this time, between Saratoga and Ballston, and just as Putnam had his house completed, some gentlemen riding past, and observing the house, said, in the hearing of Putnam, "That man has forgotten the admonition of John Rogers, 'Build not your house-top too high.'" This was the realization of the day-dreams of Putnam's childhood.† In 1805, he purchased from Henry Walton, another strip of land, which was forty-four rods wide and four hundred and seventy-two rods and seven feet long, and extended from the east side of what is now Franklin street to the lands of Jacobus Barhyte, containing one hundred and thirty acres. On the west end of this purchase he laid out a village, in the southwest corner of which, being a portion of the last purchase, he appropriated a piece of land for a burying-ground, which he afterward gave to the village, and in it, many of the "forefathers of the hamlet sleep."

* This building, with its wings, is 650 feet in length, and contains about 400 lodging-rooms; and the grounds occupied by the buildings and appropriated to the use of the hotel, are in area about four acres.

† His sign was a rudely-painted representation of Putnam and the wolf, and is now in the possession of his grandson, George R. Putnam. The tavern was on the site of the present Union Hall, now owned and occupied by his descendants, until 1864, when it was purchased by the Leland brothers.

In 1806, he excavated and tubed the Washington Spring, and soon after this he tubed the present Columbian Spring. The number of strangers at the Springs began now to increase annually, some of whom would come up from Ballston, take dinner with Putnam at Union Hall, drink the Congress water, and return to Ballston. At this time, he built a bath house on the ground directly north from Congress Spring, and six or eight feet from the fountain, to supply mineral water for which he excavated a mineral spring about fifteen feet from the present Congress fountain.

Putnam next tubed the Hamilton Spring and sometime afterward moved his bathing house from Congress Spring to the Hamilton. In 1811, he began Congress Hall;* while his masons were plastering the north end of the piazza, he was walking upon the scaffolding, which at the moment gave way, and the whole party were precipitated on to the timbers and rocks below, the floor not having yet been laid. The master-mason, Sullard, died instantly, his neck being broken. All the masons who fell were more or less injured; Putnam had some of his

*In the year 1814, Congress Hall property was purchased by Grandus Van Schoonhoven, and, in 1815, he finished the buildings according to the plan of Mr. Putnam, and opened the house for the reception of company. Mr. Van Schoonhoven kept the house until 1822, when he associated with him, in business, his nephew, Samuel H. Drake, Esq. The ensuing year, the company was still further extended by the addition of John E. Beekman, and John McDougal Lawrence, as silent partners. From the year 1823, the house was leased from time to time, until 1855, when Henry H. Hathorn and Harvey P. Hall, purchased the property of Z. V. Kingsley, Esq., one of the descendants of Mr. Van Schoonhoven.

Messrs. Hathorn & Hall, greatly extended and improved the house by adding a brick wing, which, at its eastern end is six stories high and ex-

ribs broken, was otherwise bruised, and was confined to his bed for several weeks after the accident, and it is supposed he never entirely recovered from the injuries which he sustained by the fall. In the ensuing November he was attacked by an inflammation of his lungs, of which he died on the first day of December, 1812. He was the first to be laid in the burying-ground which he had presented to the village, and thus ended the earthly career of this hardy, resolute, and enterprising pioneer, whose labors were so interwoven with the early history of the place.

It was to Putnam that we are indebted, more than to any other individual, for improvements at the Springs, during this period of its history. His enterprise and energy cleared away the forest-trees from the adjacent plains, converted the rich pineries into materials and means for the further development of the town, erected public buildings for the accommodation of visitors, opened highways about the town, improved and laid out streets in the village; excavated, tubed and secured the mineral springs. He was emphatically the man of his

tends from the old building east on the south side of Bath street, to Putnam street. They also altered many of the old rooms, and furnished the whole building in modern style. In 1857, Richard McMichael, Esq., purchased Harvey P. Hall's interest in the property, and the company made another addition to the building, so that, at the present time (1859), it is one of the largest hotels in the country, and well furnished.

The grounds extend on Broadway 379 feet, and east on Bath street to the west line of Putnam street. And the proximity of the hotel to the Congress Spring and its truly beautiful park, makes it one of the most desirable summer resorts in Saratoga. In 1864, Elliott McOmber, purchased the interest of Richard McMichael, and the new firm greatly enlarged and improved the hotel.

day in this locality, and he made such an impression on the place of his choice, that his name must be coëxistent with the history of the village, which his energy did so much to develop. He possessed a will which no ordinary obstacle could long withstand, and by his exertions the din and hum of civilization soon took the place of the deep and solemn murmur of the primitive pine forest.

Originally a rocky ledge lay along the bluff which faced the valley. This ledge began at the Columbian Spring, thence running in a northeasterly line to the south side of Congress street. From this point it took a more northerly direction, passing over the ground now occupied by the Congress hall, and the present row of buildings north of it, on the east side of Broadway, until it reaches the spot on which Nathan Lewis built the second brick house ever erected in the place. This house is still in good preservation, and is now occupied by George H. Fish, as a drug store. From this point, the rock dipped toward the north with so strong an angle, that, at a distance of only seven or eight rods, a well was sunk to the depth of thirty feet and yet did not come to the rock. Through a deep gorge in the table-land, leading to the valley near what is now Caroline street, passed the surface and spring water of the gradually rising land which lies in the rear; to pass this gorge, the wagon road from the Congress Spring to the High rock was made to run westerly nearly as far as the Globe hotel. After passing the gorge, the road took a more easterly turn to the upper village, through the Ten Springs; thence easterly on the sandy ridge north of the Bear swamp to Scidmore's tavern; from

Scidmore's (now Birch's), to Grangerville, and Schuylerville, on the Hudson river. Over this road passed much of the lumber of these extensive pineries. Just above the present Columbian Hotel, this rocky bluff again appears, and extends to the sandy ridge north of the upper village. So barren was this ridge of rocks, that only a few shrubs and cicuta grew upon it.

Miles Beach moved from Ballston, to this place about the year 1806. He built a store on the site of the brick building, recently burnt, next north from Congress Hall,* on the east side of Broadway, which was the first store opened in this part of the village. He afterward built a distillery on the back part of the same lot. The first brick house in the place was built by Ashabel Andrews, on the south corner of Washington street and Broadway, and was the residence of the late Rev. Francis Wayland.† Nathan Lewis afterward built the Pavilion, which was opened May 26th, 1819; it stood on the east side of Broadway, and north from the Columbian Hotel. The Pavilion was surrounded by handsome grounds, on which have since been built the present Presbyterian church, the residence of D. B. Harrington, Esq., and at the present time the residence of the Hon. James M. Cook. The Pavilion was destroyed by fire several years since.

The first clearing in the south part of the village was made by Indian Jo, a half-breed, on the rising ground south of the Union.

* Congress Hall was burnt May 29, 1866.

† Since this work has been in press, the building has been demolished, and the site is now occupied by a portion of Union hall.

In 1783, the springs had become so important that GENERAL PHILIP SCHUYLER opened a road to them, twelve miles through a forest from the mouth of Fish creek, where he had effected a settlement, erected mills, and made many other improvements. Here he raised a tent, under which he and his family remained several weeks, and used the mineral water. And so much were they pleased with the effects of the water, that the next year he built a small house, for the use of himself and family during the summer season, which he continued to occupy every succeeding year of his life. This was the first framed house built in the place. It consisted of two rooms, with a stone fire place and chimney; and was finished inside and out with rough boards.

In 1823, JOHN FORD built the original part of the United States Hotel. Two years after he added the south wing. Afterward it passed into the hands of James M. Marvin & Co., who have made annual improvements in the buildings and grounds. This hotel is now among the most capacious and fashionable public houses in the country; there are about six acres in the grounds, and it requires a mile and a half of roof to cover the buildings.*

The TAYLOR BROTHERS, who were the earliest merchants in the place, began business at the upper village, and also carried on a heavy lumber trade. The Taylors were active, business men, and were more or less connected with all the important events belonging to the early history of the country.†

† For a full history of the Taylors, see Steele's Analysis.

* This large hotel together with the Mansion house was destroyed by fire.

WILLIAM WATERBURY was the son of Josiah and Mary Waterbury. He was born in Stamford, Vt., Nov. 24, 1766. At the age of nineteen married Miss Anna Crawford. When twenty-one years of age he emigrated with his wife to East line, in the town of Ballston, Saratoga county, where he remained two years, and then purchased the farm now occupied and owned by Elihu Wing, in Greenfield. Two years after he sold this farm, and purchased a farm of one hundred acres, which lies next south of what is now Congress street, in the west part of the village, for which he paid $3.25 per acre. His deed was executed by Thomas Storms and John K. Beekman, then residents of the city of New York. William and his brother Samuel afterward came in possession of a piece of land which had been owned by Benjamin Risley, and afterward sold by him to Silas Duel. Samuel improved his part, and occupied it for several years, and then sold it to Frederick Ellsworth, and removed to Chatauque Co. A part of the house on the north side of Congress street, now owned and occupied by Jonathan Pitney, is the original building erected by Samuel Waterbury. William Waterbury made agriculture his main business, but afterward added that of a butcher. In the winter seasons he was employed with his team in hauling lumber for his neighbors, from the surrounding pineries to the Hudson river. Waterbury connected himself with the Baptist church in the year 1811. The society was then under the care of Rev. E. P. Langworthy, who remained its pastor for eighteen consecutive years. Their first house of worship was a log building, which stood on Shipman's hill, about four miles

south of the springs. They next, in 1809, built a frame house on the Ellis farm, two miles south of the village, which was afterward removed up to the village, and is now one of the out-buildings of the United States Hotel. Some beautiful trees standing about eighty rods east of Carrigan's mills, on the south road which leads to the residence of the late Isaac Patrick, mark the place which this building occupied. The society continued to meet at this place, until 1821, at which time they erected a house of worship, on a lot presented to the society by Gideon Putnam's heirs. The present Baptist church edifice, completed in 1856, stands on the same spot.

At the time Gideon Putnam laid out the village, he set apart this site, on which to erect a house of worship, and directed it to be given to any religious society who would place upon it a suitable building. The Baptist society were the first applicants, and it was accordingly deeded to them by the heirs of Gideon Putnam.

When William Waterbury first reached the county, he owed the man who moved him seven dollars, and had but two and a half dollars to pay him with. He also owned a mowing scythe, and a pocket knife; really a small outfit of implements, and not over-well adapted to begin life in a forest wilderness. He was elected constable, which office he continuously filled for eleven years. He died on the 16th July, 1843.

Hon. HENRY WALTON, one of the largest land-holders of the place, was born in the city of New York, on the 8th of October, 1768. At the age of twelve years, he was sent to England, under the special guardianship of Peter Van Schaack, Esq., of Kinderhook, to be educated.

In his twentieth year, he returned to the city of New York, and commenced the study of law, under the direction of the late Aaron Burr. After the conclusion of his legal studies, in the year 1790, he removed to the town of Ballston, in the county of Saratoga, where he had purchased a tract of land, and built a house. This place is now known as the "Delavan farm." He remained upon this farm until the year 1810, when he sold it to a Mr. Porter, and removed with his family to the city of Albany, where he resided until the year 1816; when he came to the village of Saratoga Springs, and took possession of the real estate which he inherited from his father, and his uncle, who died without issue. During his residence in Albany, in 1815, he built Pine Grove,* and occupied it for a few years, when he returned to the city of New York. After an absence of five years, he returned to Saratoga Springs, and immediately erected a beautiful country seat on that part of his real estate lying north of the village, to which he gave the name of "Wood Lawn." His possessions in this place were bounded by what is now Congress street, on the south; John Denton's farm on the north; and lands of Jacobus Barhydt, and others, on the east, including all the present village of Saratoga Springs, except what lies south of Congress street, and the mineral fountains. He inherited also many other tracts of land in different parts of the county.

Henry Walton was a tall, fine-looking man; truly gentlemanlike in his manners and feelings, he had the

* The present residence of Ex-Chancellor Walworth.

faculty of binding to himself in close social ties the educated and refined about him. He was warmly attached to the Episcopal church, and was one of the principal men whose early efforts were brought to bear in behalf of this society at the springs. To him belongs the honor of presenting the site for the first Presbyterian church edifice built in this place.* And also the site occupied by the Universalist church on Church street. The grounds now occupied by the "Broadway Hotel," were given to the Methodists by him. He excavated the shaft, tubed the Flat-rock Spring, and built over it a chaste little Chinese structure, which remained over the fountain for many years after his death. He also excavated and tubed the President, afterward called Saratoga Star Spring since 1862. Mr. Walton was a man of high culture, and polished mind; with tastes refined by nature, and cultivated by travel and observation. He was his own architect, and his skill in this branch of art has been illustrated in his several residences, at Ballston, Saratoga, Greenfield, Wood Lawn, and in the Pavilion Hotel, built by Mr. Lewis in the years 1818 and 1819. He died in the city of New York, on the 15th of September, 1844, in the seventy-sixth year of his age.

* The Rev. D. O. Grieswold was the officiating clergyman of this society, at the time the edifice was erected, to whose efforts the society is largely indebted for its early prosperity and usefulness.

CHAPTER III.

GEOLOGY.

The rocks of this county belong to the Laurentian and Silurian ages. The Laurentian rocks are the oldest which have been geologically examined, and until recently were supposed to have been formed before the introduction of animal or vegetable life upon the earth, and were therefore called Azoic. But recent discoveries connected with the Canadian geological survey, have proved this supposition incorrect for the Rhizopod and other associate fossils have been found, even in the lower beds of the Laurentian system. These discoveries have induced geologists in different countries to discontinue the name of Azoic and adopt in its stead, that of Laurentian in accordance with the suggestion of Sir William Logan. This is also the only universal rock formation now known upon the earth. It forms the highest mountains, and underlies all other formations. The different epochs of the Laurentian system, are represented by the crystaline limestone, the gneiss, granite, and syenite rocks. The crystaline limestone does not exist as a surface rock within the limits of the county. The other three are abundant in its northern and western portions, and compose the mountain masses of the Kayaderosseras and Palmertown ranges. Beds of available granite occur in the different ranges, and particularly in the southern outcrops of the Palmertown mountains about two miles north of the village of Saratoga Springs. These

beds lie within short distances of rail roads, and as it is a down grade from these quarries to tide-water, blocks of granite of any desirable size, may be practicably conveyed to the river and seaboard cities.

Among the minerals of these rocks, are the chrysoberyl, tourmaline, garnet, feldspar, apatelite, and mica, all of which occur in a single vein of granite traversing gneiss, and are to be found in the town of Greenfield, about one mile north of Saratoga Springs.

The iron ores worthy of mention in the county, are the magnetic of the town of Hadley, several veins of which vary in width from five to eight feet, occur about two miles southwest of the confluence of the Sacondaga river with the Hudson. Iron has been manufactured from the Porter bed of this locality of a quality as good, and even superior to the celebrated Arnold ores. The beds are above and near the Adirondack Rail road, and the ore can therefore be placed upon cars by means of simple and inexpensive mechanical arrangements, and be thus conveyed by rail to reducing furnaces, and thence to available markets.

SILURIAN AGE.

This age immediately succeeded the Laurentian, and is coëxtensive with it, except in mountainous districts, which at this age were not submerged by the Silurian seas. Fossil relics of these waters are abundant in the rocks of this period, showing the existence of marine animals and plants at this early date in the earth's history. It is farther evident from these records, that three if not four of the earliest divisions of animals

were represented upon the earth at this time. Most naturalists now agree that radiates, mollusks, and articulates lived at this period, while some, among them, as Professor Agassis claims for it, also the vertebrates, while in the next age, the devonian, no new varieties even, were introduced.

The rocks of the county, which remain to be described belong to the Lower Silurian, a subdivision of this age. These lie unconformably upon the Laurentian, commencing near the base of the mountain, and thence passing over the remainder of the county.

POTSDAM SANDSTONE.—These rocks lie unconformably upon those of the Laurentian age. The lowest stratum is composed of water-worn pebbles of different sizes, held together by a siliceous cement so strong that the pebbles will often break under the hammer before the cement yields. As the strata are repeated the pebbles disappear, and rocks composed of fine grains of silicates firmly cemented together appear instead. These strata often occur in thin layers which are easily quarried in pieces of any desirable length and breadth. Such of the layers as have been formed under shallow and quiet water, often contain beautiful ripple marks.

In different parts of the state of New York, fossils appear in most, if not all of the Potsdam strata; but in this county they are only found in the upper layers of the formation, and more particularly those which lie next to the Calciferous rocks.

Until quite recently these rocks were called the paleozoic base, but now and for reasons, stated in the history of the Laurentian system, this base has been given to

an earlier period in the earth's history. Although the strata in this geological epoch are often quite thin, even reduced to a few inches in thickness, yet in the aggregate the epoch often measures hundreds of feet. In different parts of this county it will sometimes probably measure about one hundred feet in depth. Metals have been found in many parts of our common country in segregated rocks of this epoch.

CALCIFEROUS SAND ROCK.— This rock belongs to the Potsdam period, and the Calciferous epoch. It is composed of lime and silica and hence its name. When long exposed to the elements, the lime weathers out leaving behind the silica, and the rock presents a rough, and to the common observer, an uninteresting surface. The lime and silica of this formation are supposed to be of organic origin, and some of the animals and plants of this period have been preserved as fossils to the present time, while others, as the diatoms, and those which cecreted the silicates and the lime being more delicate in their organizations, have been destroyed.

Geodes frequently occur in this rock having their surfaces covered with crystals of quartz, while in others the crystals lie loosely in the cavity of the rock and rattle as the stone which contains the geodes, is moved. In these cavities, and occasionally in the body of the crystals small pieces of anthracite sometimes occur. These are supposed to be the earliest coal formation on the earth.

OOLITES are found in one of the upper strata of this formation, and in the town of Greenfield about three miles west of Saratoga Springs. Near the layer which

contains the oolite, if not the next above it, is that containing the stromatopora, which in this locality lies immediately below the Trenton limestone. The formation within the county is not rich in fossils. The dip of the rock is to the southeast, and often about 45°. The rock in the central part of the county, has been much used for basements of buildings, and in the village of Saratoga Springs, where it abounds, one of the principal churches and some private residences, are built of this stone.

TRENTON LIMESTONE.

The name of Trenton was first geologically applied to the rocks at Trenton Falls, Oneida Co., N. Y., where this formation is abundant, but still more recently the name has also been given to a geological period and epoch. The period includes the Chazy, Birdseye, Black river and Trenton limestones; while the Trenton epoch contains only the Birdseye, Black river and Trenton rocks. In this county all the rocks of the Trenton period are wanting, except the Trenton formation which appears at three points. One a narrow strip commencing in the south-west part of the county and extending in a northerly direction, about midway between the base of the Kayaderosseras mountains and the slate, to the south point of the Palmertown range. The second is a still smaller parcel which lies south of the Palmertown, while the third portion is situated on the south bank of the Hudson river, and east of the Palmertown range and

extending easterly nearly to Baker's falls. Each of these parcels rests conformably upon the calciferous sand-rock. This rock is of a blackish color, easily wrought, and some of the strata have produced fair black marble.

This formation is the source of the quick lime used in the county. It is also cut into window caps, sills, and water tables for most of the brick buildings in the county. This geological period represents an extremely active animal existence in the earth's history. The rocks are mostly composed of shells. Some strata appear to be formed of shells pressed together, while others are the product of similar organic remains first finely pulverized, and then pressed into deep rock strata. Both the animal and vegetable remains of this period are marine, and mostly the product of clear water of the Silurian seas. Although the quantity of the rock belonging to this period is comparatively small in the county, yet as a geological formation, it is almost of continental extent, and in some localities is two or three hundred feet in depth. Vast must have been the amount of animal life which contributed to its formation.

The stromatopora, a not very common fossil, appears about two miles west of Saratoga Springs.

HUDSON RIVER PERIOD.

The remaining rocks of the county belong to the Hudson river period, and are composed of the Utica and Hudson river slates and shales. The Utica formation is the older of the two, and extends along the south western line of the county and thence to its northern boundary.

This formation together with those of the Hudson river slate, are the surface rocks of more than one-half of the county. The slates form the bed of the Mohawk river along the south line of the Hudson, from its confluence with the Mohawk to within a short distance of Glen's Falls, of the Kayaderosseras, from Rock City Falls to Saratoga lake, of Fish creek, and of Ballston, Round, and Saratoga lakes. It is the rock which immediately underlies nearly all of the sand plains of the county. The rocks are nearly black in color, and lie horizontally, except along the high land between the Hudson and Saratoga lake, and a few other places, where it appears at all angles. It is never used for any available purpose.

SNAKE HILL.

Geologists are not quite clear where this formation belongs. There has not been a sufficient quantity of the fossils procured to settle beyond a doubt its lithological position. Most of those which have been obtained, however, clearly belong to the Trenton period. The whole uplift between the lake and the river, appears to be a series of slates, shales, and sandstones alternating with each other, some of which as at the north end, have been greatly disturbed since their formation.

DRIFT FORMATIONS.

The pebbles, gravel, sand, and fine dust, the debris of earlier rocks are not without their lessons of interest and instruction. River terraces which lie along the banks of our larger streams, are composed of fine particles of

sand and gravel, assorted by the currents of the several streams upon which they lie, and then laid down in distinct laminæ or strata. Four distinct terraces rising one above the other, with their flattened summits spreading out toward the mountain base, may be seen bordering the Hudson river. These terraces are particularly observable, as one enters the county on the rail road from the south, and continues north to the village of Saratoga Springs. The bottom strata of most of these terraces, is composed of pebbles, clay, and sand, called "hard-pan," so firmly packed together that it is often quite as difficult to penetrate as would be most of the rock strata which lie below.

The next stratum above is BLUE CLAY; the next FERRUGINOUS CLAY, and the last is composed of sand, the grains of which vary much in size. This upper stratum contains more or less vegetable mould. This mould increases in depth as the terraces approach the river. And so abundant is it in the "river bottoms," that the land is made very productive by the annual dressings furnished by the forests upon the mountain slopes.

ANCIENT SEA BOTTOMS appear next above the terraces. The debris in these formations contain no pebbles of slate or strata of clay. The drift appears in oval ridges, always lying in the same direction, their larger extremities always pointing to the east, north-east, and thus pointing out the direction of the ocean current during this period. Some of these deposits do not rise more than three or four feet above the surface, while others rise more than a hundred, yet all invariably present the same characteristics.

THE SEA BEACHES, are next above the bottoms. They lie high upon the mountain ranges, and are composed of water worn pebbles, sand and gravel. These often from long exposure to surface currents of water which annually pass over them, nearly or quite at right angles, are finally cut into sections, and hence the festooned appearance about the brow of the mountains. Some of these sections are even a hundred feet in depth.

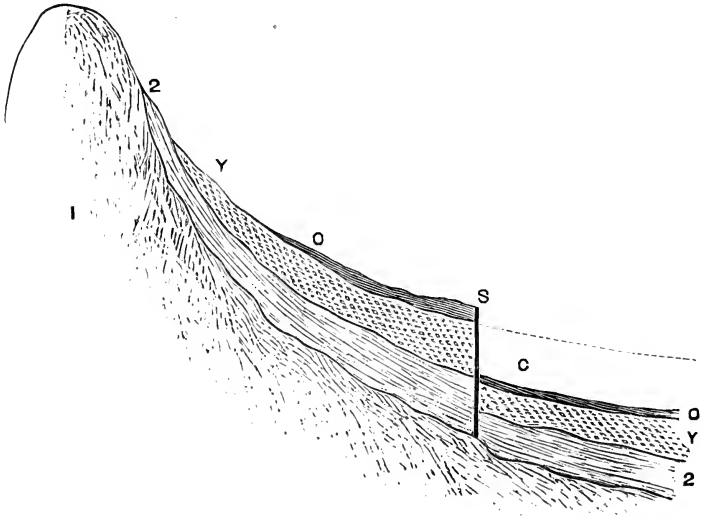
ANCIENT DRIFT. Above the sea beaches and over the tops of the mountain peaks may be seen the *Ancient drift* The pebbles of this formation are from the Laurentian and Potsdam periods, as well as the sand and gravel in which they lie imbedded. After leaving the sea-bottoms, the deposits above on the mountain slopes on more or less assorted, but they seldom if ever show any stratification. The currents in the ocean at the time the ocean bottoms were formed, were precisely in the same direction as the currents which moved forward the ancient glaciers, and which polished acres of the old rocks and cut in them those deep and long parallel scratches, which are now to be seen traversing the rocks of the Potsdam period.

MINERAL FOUNTAINS.

All mineral springs derive their properties from the rocks over which they flow, or through which they percolate, during their subterranean course, and before they reappear upon the surface in the form of springs. The surface water which falls upon the eastern slope of the Kayaderosseras range, flows over the exposed edges of the Silurian rocks, and freely penetrates through them all

down to the Laurentian formation. When some of the outcropping edges of the Silurian rocks, are from one to two and even three hundred feet above the rocks from which the fountains rise, a great hydrostatic pressure must result, by which the water is forced through the deep salt bearing rocks, and then raised to the surface along the mineral valley. These subterranean currents on reaching the base of the mountain, come in contact with a "fault" and rise through it to the surface. This fault is a fracture in the earth's crust, which penetrates several geological epochs. It is not merely a simple fracture passing deep into the earth's surface, but the rocks on the west side of the fault, are hundreds of feet above the corresponding ones upon the east side. This displacement also serves to prevent the free flow past the fault, for the Hudson river slates being opposed to the Lower Silurian rocks form a most perfect barrier, and the mineral water is forced up through the crevice in the rocks by hydrostatic pressure.

The minerals of the several fountains are probably derived from the rocks of the Potsdam period, for the water of the surface as well as in the rocks below flow from the west, and the mineral water comes from the west of the fault, where great displacements have taken place in the rocks, as at Saratoga Springs. These rocks were formed under the Silurian seas as is evident from the fossil relics which they contain. They being very porous, are capable of holding large quantities of saline substances, which are gradually brought out by the surface water which is forced through them, and hence the uniform flow of mineral water through our valley.



1. Laurentian.
2. Potsdam.
Y. Calciferous Sandrock.
O. Trenton Limestone.
C. Slates and Shales.
S. Fault and Mineral Springs.

CARBONIC ACID.

Different kinds of rocks produce different gases, and the same general formation sometimes originates different gases at different depths in the rock. In boring for water in the city of Albany, at the depth of thirty feet sulphuretted hydrogen was developed, at the depth of two hundred and fifty feet carburetted hydrogen, while at the depth of four hundred and eighty feet below the surface carbonic acid and saline water were also found. Here in the same geological epoch three different gases were found in the same perforation. The same results have been obtained the present season near Round lake in this county.

Carbonic acid and saline water have been spontaneously flowing up through the same formation for ages at Ballston, Ellis Mills, Quaker Springs, Wilton and Argyle, in Washington County; but the Potsdam and Trenton periods are not far below the slate in these places. The same kind of carbonated waters rise also at Saratoga Springs from the Potsdam period. And as the fountains of this place have been found superior to all the springs of the kind, it is probably fair to conclude that all the mineral properties, both of salts and gases, are derived from the old Silurian rocks. It is also true that clay-beds lying upon the Silurian rocks near, and also miles back towards the mountains from the mineral fountains are all highly charged with carbonic acid, but such of them as lie upon the Laurentian rocks, give no evidence of carbonic acid. It would therefore

appear that all the mineral constituents are derived from the Silurian rocks, and even the older members of this system.

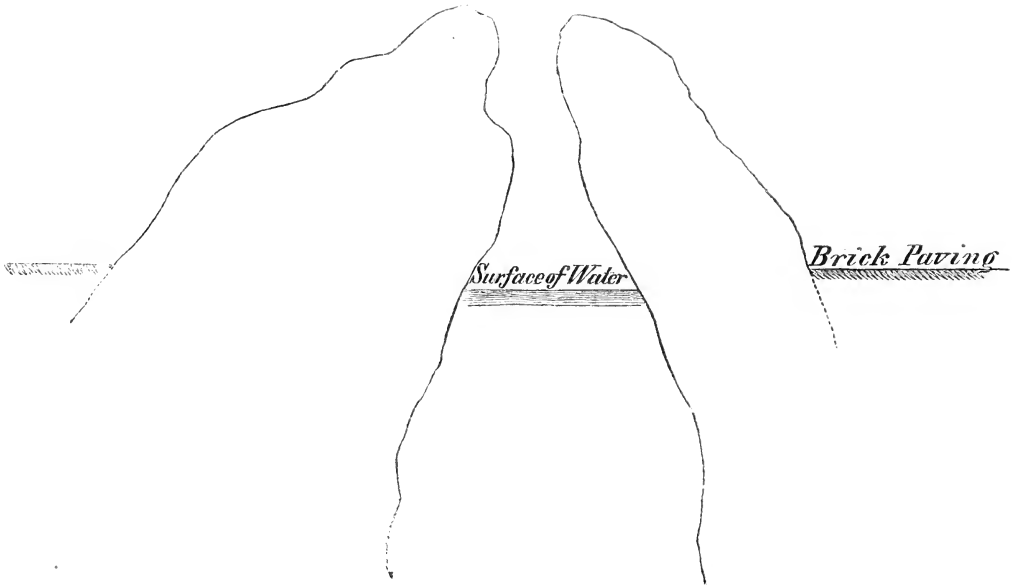
HIGH ROCK SPRING.

The High Rock Spring is justly considered one of the greatest natural curiosities in the world. It was known, and was used medicinally by the aborigines. Dr. John H. Steel gave the first scientific description of the rock, and it was published in Silliman's Journal, pp. 242, 246. Dr. Valentine Seaman in 1809,* also published a description of the spring; and in the course of his remarks, he says: "The more we reflect upon it, the more we must be convinced of the important place this rock ought to hold among the wonderful works of nature. Had it stood on the borders of the Logo d'Agnans, the noted Grotto del Cani, which, since the peculiar proprieties of carbonic acid have been known, burdens almost every book which treats upon the gas, would never have been heard of beyond the environs of Naples; while this fountain, in its place, would have been deservedly celebrated in story, and spread upon canvas, to the admiration of the world, as one of the greatest curiosities."

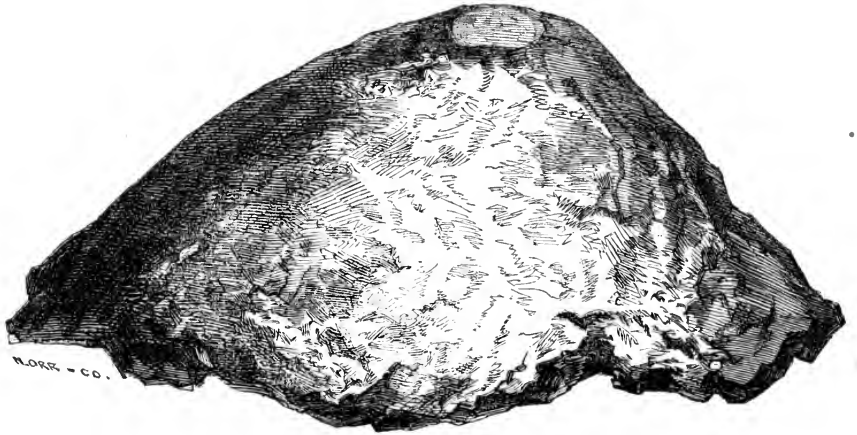
The following measurement of High Rock was carefully made in 1856:

At the surface of the ground, the circumference of the High Rock is	24	feet	4	inches.
Diameter of aperture, four inches below the top			12	"
Height of the rock above the ground	3	"	6	"
Water in the rock above the ground	1	"	4	"
Depth of the spring from the top of the rock	10	"	0	"
From the top of the rock to the water within	2	"	2	"

* The first edition of Dr. Seaman's work was published in 1793.



VERTICAL SECTION (NORTH AND SOUTH) OF HIGH ROCK, SARATOGA SPRINGS, N. Y.—SCALE, 2 FEET TO 1 INCH.



North View of the High Rock, Saratoga Springs, N. Y.

The walls of the rock are of nearly uniform thickness throughout. This gives a pyramid of water within the rock, not dissimilar in form to its external surface. See Plate.

Water under the pressure of the atmosphere holds its own volume of carbonic acid gas in solution; more volumes of the gas may be dissolved in water by pressure alone. The mineral waters of Saratoga, at the temperature of 212° disengage one and a half volumes of carbonic acid. The mineral substances held in solution in the springs by this gas, are magnesia, lime and iron; these substances, together with a few other materials from the surroundings of the fountains, as leaves and twigs of trees, &c., compose the High Rock. This is not an isolated instance of this kind of formation at Saratoga, for deposits more or less extensive may be found about the apertures of other springs. This highly charged water, on rising to the atmosphere, can hold but one volume of the gas in solution; it, therefore, precipitates its excess of carbonates about the orifice of the fountain in small particles at a time, and if these precipitates are suffered to rest and to accumulate, they will in time unite with each other, and a rock of calcareous tufa of greater or less size is the result. The Flat Rock being covered by the soil has not been so frequently seen, yet quite a large amount of this deposit has been thrown down at this place.* About the mouth of the Empire Spring was also a deposit of tufa, in the form, and about the size of an inverted two quart bowl, having in its top a perforation of about two inches in diameter, and of an oval form. From the nature of the case these

* The same is the case about the High Rock and Range springs.

deposits must always be going on; but currents of water may move them away mechanically, before they have a period of repose long enough to accumulate and become cemented together, as was the case with the original Congress Spring. The position of the rock, out of the side of which it flowed, and the shape of the surface of the ground, together with its rapid descent to the brook which runs near, prevented any accumulation of tufa at this spring.

It will be seen then, that the High Rock is not *sui generis*, as some may have supposed; but it nevertheless, so far as is known, is the *great* specimen of its kind. It stands high above the ground, is accessible, but yet it is probable, that but few comparatively who view it, realize the fact, that the specimen before them is perhaps the most remarkable of its kind upon the whole face of the earth.

And in this connection may I be permitted to urge upon the inhabitants of the village, as well as strangers, sacredly to abstain from marring, defacing, or removing a single atom of the stone. For be it remembered, as a specimen, it belongs to the world, and every person is in duty bound to protect it.

This water, as we have elsewhere said, continued to be used by the inhabitants, until the discovery of the Congress Spring, in the year 1792, which, as it proved to be less stimulating, was better adapted to the majority of cases, though the water of the High Rock has always been uniform in quality, and is one of our best tonics. This spring is a little remote from the large hotels of the place, and is not therefore so much used as it ought

to be, by debilitated patients. It is situated in the north part of the valley, a short distance from the Star and Empire Springs. The land rises rapidly in its rear, to the height of thirty or forty feet, the grounds about the springs are unimproved. And it is a sad mistake, that the original forest-trees had not been left standing, so that this *great specimen* might be seen as nearly as possible, in its primitive state! *

In the year 1767, the Indians introduced the waters of the High Rock Spring to the whites, as a remedial agent. During the quarter of a century which immediately followed Sir William Johnson's visit to the springs, but a few improvements were made, and these were limited to the immediate vicinity of the High Rock; and the knowledge of the country which the whites possessed, was also confined to such portions of it, as lay along the trails which led from the settlements on the river and the lake to the mineral fountain. Yet the spring continued to attract more and more attention. Persons traveling from one section of the country to another, if practicable, took the mineral fountain in their way, drank the water, and amused themselves in hunting in the surrounding forests.†

* Since the publication of this work a tasteful brick building was erected over the spring, by the late W. B. White, Esq.

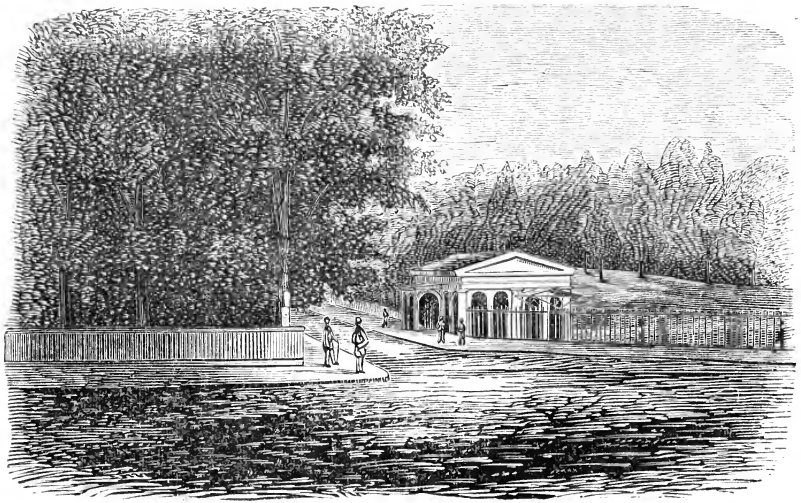
† While this edition is going through the press Messrs. Ainsworth and McCaffrey, who have recently purchased this Spring, are making great changes in it, by taking down the Octagon building placed over the Spring by the late W. B. White, Esq., for protecting the Tufa rock which has given a world wide reputation to the fountain; cut off this rock a few inches below the surface of the ground; excavated a liberal shaft down to the calciferous sand-rock; secured its Mineral water in the usual way by a wooden tube packed about with clay; and finally have placed the upper

CONGRESS SPRING.

In the year 1792, or twenty-five years after the visit of Johnson to the springs, a party had been on a hunting excursion in a southerly direction from the High Rock, and when returning to the settlement, entered upon a trail which led them to a new spring. At that time the water flowed from an aperture in a rock, which was a part of the general ledge which extended from the Columbian Spring to the High Rock. The direction of this ledge was nearly east, for about two hundred feet from the Columbian Spring, and at this point the ledge took a more northerly direction; this change in its course gave a prominence to the portion of the rock situated at the angle, and this was the point from which issued the original Congress Spring. This rock was about three feet high, and the aperture through which the water flowed was about eighteen inches from the ground, and the water trickled over the side of the rock, which lay within a few feet of the brook, and soon mingled with the stream, and passed away through the valley. One of this hunting party was John Taylor Gilman, who was at the time a member of Congress. On testing the water they were particularly pleased with its quality; and after repeated visits to the spring, in

portion of the Tufa rock over the top of its wooden tube in the hope that the water may hereafter flow over the rock as it doubtless did during its early history. What success will follow these changes time must determine.

During the late excavation three forest trees were found deeply imbedded in the Tufa rock, and curbing a triangular space about the mouth of the fountain. These trees checked the flow of mineral water, caused a deposit of the earthy carbonates, and finally produced the High Rock.



CONGRESS SPRING.

company with the most prominent men of the settlement, they in counsel, named it Congress Spring; thereby handing it over to the people of this commonwealth, who have ever since enjoyed its benefits.

The water rapidly rose in reputation, and soon became the favorite spring. It was secured by pressing a drinking vessel against the rock; of course in this way it took a long time to obtain small quantities of the water, for it discharged only about one quart per minute, and a large portion of this was necessarily lost, but all agreed as to the quality of the water. About this time Gideon Putnam's far-seeing eye discovered, in part, the future importance of the spring; and he immediately made purchases of land in its vicinity, and began his improvements. As the accommodations for strangers improved, the demand for the water increased beyond the supply furnished by the spring.

To obviate this deficiency, Putnam turned the brook a few feet to the north of its original channel, and being directed by bubbles of gas which were constantly rising through the empty channel, he sunk a shaft to the rock, when the water ceased to flow from the original aperture, but rose in abundance from the old channel, and was secured in a tube made of pine planks. After filling in about the tube, the water continued to rise and the supply has ever since been inexhaustible. At one time Putnam had two potash kettles evaporating the mineral water. The salts thus precipitated they sold in small packages, which during some years amounted to several hundred dollars. But it was soon found that these precipitated *

* See *post*.

salts did not produce Congress water when redissolved, and the further evaporation was abandoned.

In 1826, John Clarke, a native of Yorkshire, England, purchased from the Livingstons the farm on which the Congress Spring is situated. Mr. Clarke was well calculated, by education and experience, to take charge of the spring, being well acquainted with the properties of acidulous drinks, he having opened the first soda fountain in the city of New York. Soon after Clarke's purchase of the spring, he began bottling the water for exportation, and so well did he do this that he very soon realized a handsome annual income from this source alone. Mr. Clarke extended his purchases of real estate from time to time, so that at the period of his death, he owned in lands, contiguous to the spring, about one thousand acres. His improvements were always of the best kind, as may be illustrated by the beautiful crescent lawn, which he reclaimed from the deep mud swamp, which lay south and east of the spring. The classic Doric structure, as it originally stood in its simple beauty, over the Congress Spring, and the pretty Grecian dome over the Columbian Spring, are but incidental specimens of the many improvements, which his large means, generous spirit, and good taste bestowed upon the village.

Mr. Clarke's nurse outlived him some years; he did not forget her while he lived, and left her a handsome annuity as long as she should survive. He married Mrs. Eliza Bryer, widow of the late Charles White, Esq., of the firm of Emmet & Co., attorneys and counsellors-at-law, New York city. He died on the 6th of May, 1846, aged seventy-three years.

The Congress water continues to sustain its high reputation, and is resorted to by tens of thousands during the summer season, some of whom have paid their annual visits to the springs for forty-five consecutive years. It is a cathartic water, and should be used in the morning for that purpose. It has also been employed in cases of renal calculi, with decidedly beneficial effects.

The analysis of the water gives the following ingredients in one gallon:

Chloride of Sodium	360.560
Carbonate of Soda	8.000
Carbonate of Lime	82.321
Carbonate of Magnesia	78.242
Carbonate of Iron	3.645
Iodide of Soda	4.531
Silica	0.510
Alumina	0.231
Solid Contents	538.040
Carbonic Acid	340.231
Atmospheric Air	4.000
Gaseous Contents	644.231

Temperature of the spring, 48 degrees.

COLUMBIAN SPRING.

This fountain is situated a few rods southwest of the Congress Spring. It is a ferruginous water, and contains large quantities of carbonic acid in a free state, which rises from the surface of the water in very large bubbles, causing a motion in the spring not very dissimilar to boiling water. The carbonic acid may be collected at the mouth of the spring, to any extent desirable for scientific purposes, and at any time.

This fountain contains the same constituent properties as the Congress, but differing very much in their relative quantity. Its water is very tonic, and should be used with great caution where this kind of medicine is not decidedly indicated; but where it is so indicated, the large quantities of free gas, together with the iron present in it, render it a tonic of great value in many cases of irritable stomach, and weak digestive and assimilating organs. But its activity makes it important that it be used carefully, and subject to proper restrictions.

One gallon of the water furnishes on an analysis the following ingredients:

Chloride of Sodium	290.501
Carbonate of Soda	26.000
Carbonate of Magnesia	40.321
Carbonate of Lime	90.000
Carbonate of Iron	6.000
Iodide of Soda	3.000
Silica and Alumina	1.531
Solid Contents	457.353
Carbonic Acid	330.000

Temperature of the spring, is 48 degrees.

HAMILTON SPRING.

This fountain, situated in the rear of Congress Hall, a few rods northeast of Congress Spring, was first discovered and tubed by Gideon Putnam, Esq., and afterward retubed and brought to its present condition by Dr. Clarke. For the last twenty or thirty years it has

been most used as an alterative; for this purpose it was a favorite spring of the late Dr. Steel — and also as a cathartic for very feeble stomachs; and where the Congress has proved too active and exhausting, even in small doses, this water will succeed like a charm. As a diuretic, in many nephritic diseases, its use has been attended with the most happy results. The water within the tube rises nearly to a level with the ground, and the surface of the water is constantly agitated by a free escape of fixed air, rising in alternate bubbles from the interior of the fountain.

One gallon of the water furnishes the following ingredients on analysis:

	Grains.
Chloride of Sodium	298.656
Carbonate of Soda	34.250
Carbonate of Lime	97.996
Carbonate of Magnesia	39.066
Carbonate of Iron	4.625
Iodide of Soda	3.598
Silex and Alumina	1.000
Solid Contents	479.191
Carbonic Acid	320.777
Atmospheric Air	1.461
Gaseous Contents	322.238

Temperature of the spring, 48 degrees.

PAVILION FOUNTAIN.

This truly beautiful spring is situated in the rear of the Columbian Hotel, and a few rods southeast of the late Flat Rock Spring; it was long since discovered, and experiments made upon the water by the late John H.

Steel. Its remoteness, however, from the bank, which gave egress to the other mineral fountains in the valley, placed it in the midst of a deep morass, where it rose through an alluvial deposit of over forty feet in depth. This situation of the spring made it difficult to tube it. But in 1839, it passed into the hands of Daniel McLaren, who, braving all obstacles, at great expense of labor and time, succeeded in securing the present fountains, as well as improving the deep morass about them.

The shaft was excavated and tubed in the following manner:

A crib fifteen feet square, locked together firmly at the four corners, was placed around the spring. The work of excavation next followed, and as the swamp mud was thrown out, the *crib* was settled down, and as the excavation proceeded, the water was raised from the shaft by large pumps, kept at work day and night. In this way, the excavation was made to the distance of forty feet, following throughout the direction of the rising bubbles. At this depth they struck the "hard pan," when the gas led in a lateral direction, and toward the west. This lead they followed for several feet by cutting a trench, and then placing in it what they called a "shoe." The toe of this shoe occupied the western extremity of the trench, which was also several inches lower than the other end, or heel of the shoe. Afterward they placed a tube over the heel of the shoe in a perpendicular position, and raised it high enough to pass the surface, and such filling in as would render the grounds dry and pleasant about the springs. So the whole tube as it now is placed, more resembles

a man's *boot* than a *shoe*. The water is pleasant to the taste, and exhilarating to the spirits. It was first bottled by McLaren, in 1840, and since the repurchase by the Walton family, has been bottled by them also. It is a favorite water for drinking at the spring, both with the inhabitants and strangers.

This spring is now owned by the Messrs. Walton, who have farther improved the grounds about the fountain, by filling them in, changing the channel of the creek, laying out footwalks, planting shade trees, and constructing suitable buildings for bottling the water. The free acid of the spring is most abundant, and passes off in great quantities from the mouth of the fountain, and imparts to the tongue a smart, pungent taste. The fol lowing is the analysis of one gallon of the water:

	Grains.
Chloride of Sodium,	183.814
Carbonate of Soda,	6.000
Carbonate of Lime,	59.593
Carbonate of Magnesia,	58.266
Carbonate of Iron,	4.133
Iodide of Sodium and Bromide of Potassa,	2.566
Silex and Alumina,	1.000
Solid contents of one gallon,	315.372
Gaseous contents of one gallon,	372.499

Temperature 50 degrees.

IODINE SPRING, NOW CALLED STAR SPRING.

This fountain is situated in the north part of the village, and a few rods north-east of the High Rock.

In 1835, my attention was particularly called to the President Spring, situated quite near the High Rock

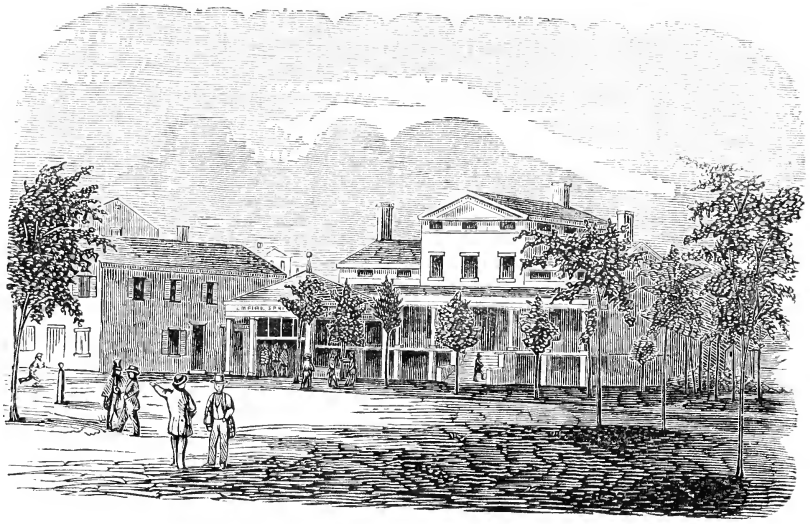
fountain. From the experiments I then made upon the water of this spring, I came to the conclusion, that if the mineral stream supplying the fountain were properly secured, the water would in all probability, bottle very well. The conclusions I had arrived at, and the reasons for them being communicated to some gentlemen of the village, they obtained a lease of the spring from Judge Walton, made a liberal excavation, secured the mineral water by a wooden tube, and thus raised it nearly to the top of the ground. To this spring they gave the name of "Iodine."

Since that time it has been subject to a number of different directors, among them as Judge Walton's heirs, and finally H. W. Merrill and J. L. Cramer. Though comparatively a light water, it proves to be well adapted for bottling. When taken in proper quantities and subject to reasonable restrictions, it sets well on the stomach.

One gallon of the water furnishes the following ingredients, on analysis :

	Grains.
Chloride of Sodium,	180.731
Carbonate of Soda,	3.000
Carbonate of Magnesia,	30.000
Iodide of Sodium,	3.235
Carbonate of Lime,	74.213
Carbonate of Iron,	1.000
Silica and Alumina,	.500
Solid contents,	292.679
Carbonic Acid and Atmospheric Air,	335.000*

* I have not analyzed this water since it was last tubed.



EMPIRE SPRING.

EMPIRE SPRING.

This spring is the most northerly one in the village which has attracted general attention. It is situated on the west side of the valley, and immediately behind it lies a bluff of Mohawk limestone, forty feet in height. This limestone appears to be a detached portion, and extends only about five rods in width by ten in length, and lies on a ledge of calciferous sandstone. The water issues through a perforation in the calciferous sandstone. A knowledge of this particular form of the opening is of great importance in adjusting a suitable tube.

Mineral water has been known to trickle down the bank at this point ever since the land was cleared of its primitive shrubs. But it attracted no particular attention, for springs of mineral water which appeared equally imposing were, and are now, to be found issuing from many points along the mineral valley, and the prominent and conspicuous position which the High Rock and the original Congress Spring occupied turned all eyes toward them. As they furnished water of the best quality and in ample quantity, to supply the demand, there appeared to be no necessity for the introduction of a new spring, and the ground about the Empire Spring was for a long time advantageously occupied by lime-kilns.

In the year 1846, the fountain was taken in charge; a shaft was excavated to the rock, a tube eleven feet six inches was adjusted to the aperture, and the Empire Spring was secured with a column of water in the tube

above the surface of the rock nine feet six inches high. The fact that the Empire water passes the calciferous sand-rock by a perforation, is of great practical value, as a tube could be scribed to the surface of the rock, and thus was obviated the necessity of employing artificial means to secure the water with its full complement of gas.

It will be easily apprehended that artificial means are scarcely available in confining, or even in directing a current of acidulous carbonated water, for materials which would be available in cases of common spring water are useless with the acidulous mineral water. The water cement answers an admirable purpose with fresh water, but with mineral waters is entirely insufficient, for it proves no barrier to the escape of the gas, and will in time be taken into combination with it, and a similar result follows in the various kinds of packing which have been frequently tested by actual experiments. But, when the gaseous water passes through a heavy stratum of rock by a small aperture, as in the Empire, a groove carefully cut in the rock around the mouth of the spring, and a well-secured pine tube properly placed in a groove, and afterward filled about with clay, is a simple and most efficient way to set a tube. This form of tubing, however, will not be applicable to those fountains which pass through the rocks in clefts and fissures. To illustrate with what extreme divisibility the carbonates are held in solution in water, and with what readiness they pass through ordinary barriers, put a pint of mineral water in a flaring vessel, say an ordinary baking dish, then apply a gentle heat until the whole salts are precipitated; the

outside of the vessel as high as the water stood will be frosted over with the precipitated carbonates which had been held in solution in the water by the gas, and not by the water. In this case the salts are precipitated, although the dish is flaring and uncovered, yet the carbonates pass through the pores of the glazing as well as through the sides of the vessel, and that too in a lateral direction.

This mineral fountain discharges seventy-five gallons per hour. It is a good cathartic and alterative water, and has proved itself adapted to a wide range of cases. And when we consider its remote situation, the popularity of other and older springs, the strong attachments which persons form by the *habit* of drinking of them, and their corresponding prejudices, we are surprised at the rapid stride this spring has made in public estimation during the short period of six or eight years.

For cathartic purposes, the Congress and Empire waters should be drank in the morning in quantities varying from one pint to three, according to the state of the case. As an alterative, from one-fourth to a whole tumbler should be taken three or four times a day.

The chalybeate waters may be taken in portions ranging from one gill to a pint, three or four times a day.

The cathartic effects of the Empire and Congress waters are increased by raising the temperature of the water 20° or 30°. If this is done by placing the bottle in warm water before drinking, the cork should be withdrawn; because the increased cathartic power is owing to the escape of carbonic acid. This water, when bot-

tled, should be kept as near to 48° Fahrenheit, as possible; and the bottle should be taken from the box and put in a refrigerator ten or twelve hours before using, which brings it to much the same temperature as when drunk fresh from the fountain.

The improvements in the north end of the town have been much increased within a few years, and particularly those in the immediate vicinity of the Empire Spring. Reducing the unwholesome swamp, opening new drive-ways, grading hills and laying out handsome village lots, are a few of the many heavy expenditures which have been sustained by Western & Co. alone. Neither have they been behind their fellow-citizens generally, in the cultivation of large numbers of shade trees, which in time will add greatly to the beauty of their grounds and avenues. And it is to be hoped that these improvements may be continued by themselves and others, with even increased energy. Nature has done much in that part of the town, and its beauty might be enhanced at small expense. If the hill on the west side of the valley were properly terraced, and willow and other appropriate trees were planted along the stream, we should have delightful promenades, and as fine situations for residences as are to be found in town. And these improvements might be carried on with an outlay by no means large.

This fountain is now under the charge of a company.

One gallon of the Empire water furnishes the following ingredients on analysis :

Chloride of Sodium,	270.000
Carbonate of Lime,	145.321
Carbonate of Magnesia,	43.123
Carbonate of Soda,	30.304
Iodide of Soda,	8.000
Carbonate of Iron,	3.000
Silica,	1.000
Solid contents,	500.748
Gaseous contents,	.700
Specific gravity,	1.056

WASHINGTON, OR WHITE SPRING.

This fountain is situated about six hundred feet in a southwesterly direction from the Congress Spring, and is the only one on the west side of Broadway, the principal street of the village.

It was first tubed by Gideon Putnam, in the year 1806, and has the singular history of being the first spring tubed in this section of the *Mineral Valley*, and the last one which has been practically reclaimed and prepared for commercial use.* And although the land on which it was first discovered has been owned by many different individuals since the first settlement of the country, some of whom have been among our most far-seeing and enterprising citizens, yet no thorough effort was made to secure the spring until October, 1858.

In the year 1856, the ground including the spring, passed into the possession of John H. White, Esq., who, during the autumn of 1858, resolved to make a thorough excavation, and trace, if possible, the mineral stream to its escape from the rock. He therefore, on the 20th of October, opened a shaft eleven feet square, which he

* Since 1858, several other springs have been practicably brought into use.

excavated to the depth of thirty feet, through clay and hard-pan, to the calciferous sand-rock underneath.

After carefully examining the surface of the rock within the shaft, he ascertained that no mineral water came into the well through it, but entered from the south-west part of the excavation through the stratum of hard-pan which lies superimposed upon the sand-rock at this place. This lead was then taken, and followed with a tunnel six feet high, five wide, and thirty in length, in a direction generally south-east. At this point, and while exploring with an iron rod the farther direction of the stream, the earth at the south-east extremity of the tunnel suddenly gave way, and the water and the gas flowed into the shaft with such force, and in such quantities, as to give the men engaged in the work of excavation barely time to escape from the pit, leaving their working tools behind them at the bottom of the shaft; and in the short space of fifteen minutes it was estimated that twelve thousand gallons of water, and probably nearly twice that quantity of carbonic acid gas, filled the excavation. At this juncture the most powerful hand-pumps which could be commanded were brought to bear upon the water, and the gas within the excavation; but they failed to clear the shaft, and the work of excavation was therefore suspended for the ensuing three weeks, during which time a portable steam engine and a powerful rotary pump were procured, and an excavation was commenced in a south-east direction thirty feet from the former one, and over the extreme terminus of the tunnel. This shaft was fourteen feet square, and was exca-

vated to the depth of twenty-one feet, and preserved from caving by a coffer dam, built with eight-by-ten-inch hemlock timbers and two inch planks. But reaching the farther depth of four feet, which was not curbed, the water and the gas broke into the shaft from the east, and again drove the workmen from their labors.

The steam pump was now brought into requisition, and was continued in active operation for eighteen consecutive hours, when a small pebble was carried in between the rollers of the pump, which stopped the machine, and before it could be removed, the pressure resulting from the accumulated water and gas, had become so great from without, that the strong timbers and plank composing the curb, gave way, and the workmen were driven a second time from this shaft, and the prosecution of the work at this spot was abandoned; but the excavation of a third shaft, twenty feet in diameter, was commenced in a south-east direction from the second shaft. But instead of the tubing which had been before used, one was employed composed of two-by-ten inch plank, cut in beveled segments, so as to form a curb nearly circular. These pieces of plank were laid one above another, so as effectually to break joints, and then nailed firmly together with six inch iron spikes, which formed, when completed, a strong tube of wood ten inches in thickness, and twenty feet in diameter. This strong curb was continued with the excavation twenty-eight feet, and nearly to the sand rock in the bottom of the shaft.

The bottom of the shaft being covered with water, one spring was seen bubbling up within the shaft, and another

was found after tunneling a few feet to the south-west. These springs seemed to be two fountains, issuing from the same fissure in the rock, within the distance of twenty feet. The more south-west fountain proved most copious, and presented a finer appearance; as the loose gravel was removed, a volume of water, one inch wide and six inches long, came gushing up out of the rock, sparkling and boiling with gas.

On the 29th of January, 1859, a tube twenty-five feet in height was placed around this jet of mineral water, and on the 2d of February, the mineral water was introduced into the tube, and two days after, it had risen to the waste pipe, twenty-three feet and six inches above the bottom of the shaft.

On the morning of the 5th of February, the gas appeared bubbling through the surface of the water in the tube, which continued to increase in quantity for several days, imparting a very active simmering and boiling motion to the water. On the 14th of February, the waste pipe was closed, and in about four hours thereafter, the water within the tube rose to the top of it, and now flows over it in a continuous stream.

This spring, so sparkling and lively, is one of the most beautiful and copious fountains in the valley. And if the mineral water is well secured at the rock, thoroughly excluding fresh water, earthy and mineral substances from the fountain, there can scarcely remain a doubt of its being ultimately bottled with success.

PUTNAM'S SPRING.

This spring is situated about two hundred yards north-west of the Hamilton Spring, and nearly equi-distant from Broadway and Putnam streets. At this point, mineral water had been observed from quite an early date in the history of the village; but it had received no particular attention until 1835, when Mr. Lewis Putnam made an excavation, and placed a tube about the fountain.

This improvement seemed to answer a tolerably good purpose for a number of years, during which time the water was bottled to some extent, and was also freely used at the fountain by persons living in its immediate vicinity. But at length the water was found to be deteriorating in quality, whereupon Mr. Putnam, in 1857, re-excavated the shaft, and found the water rising freely outside the tube, and a heavy incrustation of calcareous tufa surrounding the curb. He repacked the tube with clay, and the water is now probably as good as it has been at any previous time in its history.

From the facts already known in regard to the mineral fountains, it is fair to conclude, that the quality of the water would be greatly improved, indeed, perfected by excavating the hard-pan to the calciferous sandstone, and tubing the mineral water down to the point of its escape from the fissure in the rock. Until this is done, we cannot speak specifically of the true character of the water.

BARREL SPRING.

This fountain, is about seventy-five feet south of the High Rock Spring, and rises at the base of a high and abrupt bluff of calciferous sand-rock

In the early history of the country, this mineral spring was known, and a barrel was used for the curbing, hence its name. But as the ground about the fountain was wet and mirey, and there were more accessible springs in the immediate vicinity, this one was suffered to pass out of notice, and became so completely submerged, that comparatively few of the later inhabitants of the village, ever knew that such a fountain existed.

In 1860, the lot of ground which contains this spring was purchased by Dr. Haskins of this place, and on the 15th of November, 1865, he began the work of excavation, employing thirty men. And in two months and a half a shaft twenty by thirty feet was excavated through five feet of muck, four of tufa, twenty-one of blue clay, and four of hard-pan down to the calciferous sand rock. The tufa about this spring, is abundant and coextensive with that of the High Rock. It is doubtless the largest deposit of this substance in the valley.

In the process of excavation a birch tree, eighteen inches in diameter, thirty feet long, with portions of the roots attached, was found imbedded in the calcareous deposit so abundant about the fountain. The copious current of mineral water rising through the different strata superimposed upon the sand-rock, was limited to a space

about two feet in diameter. Through the whole depth of this space the smaller portions of sand and gravel had been carried away by the rising currents, and only the coarser ones remained, which clearly pointed out to the workmen the mineral stream. This space was about two feet in diameter.

The aperture in the sand-rock through which the fountain rises, is oval in form, about twelve inches in length, and from five to six wide. Through this aperture an iron rod was passed to the depth of fourteen feet. This space was also filled with small pebbles. The great flow of water was found troublesome during the excavation of the shaft. Horse power and buckets which raised eighty gallons per minute were sufficient to keep the shaft clear from water until the depth of seventeen feet was reached, when it was found necessary to add a steam pump of eight horse power. These kept the water clear until the farther depth of eight feet was attained, when it was found necessary to add to all, hand pumps. All these together only kept the water sufficiently down to enable the laborers to proceed with the work of excavation. The tubing is in the usual form, a hopper at the bottom six feet by five, connected with a wooden tube twelve inches square and twenty-nine in length, except that to the upper end of the wooden tube, is added one of glass three feet long, making the whole column of mineral water within the tube, thirty-seven feet. This added to that within the rock measured by the iron rod, makes a column of mineral water fifty-one feet in height. As the water rises in the glass part of the tube, globules of

gas may be seen also rising in rapid succession through the column of water, looking like flakes of silver. The abundant flow of water, the large quantity of carbonic acid which rises from the fountain, and the height above the surface to which it flows, renders this one of the most attractive springs in the valley.

SARATOGA SPRING.

This fountain is situated a few rods north of the highway, leading from the upper village to the "Ten Springs." It also rises from the west side of the mineral valley, and at the foot of a high bluff of calciferous sand rock. This spring has been known since the early history of the country, but no attempts have been made to reclaim it until the autumn of 1865, when George Western & Co. purchased the land upon which it rises, excavated a shaft twelve feet square and sixteen deep, through muck, blue clay, and hard-pan. The mineral water was then secured by the usual hopper shaped tube, packed around with clay. But imperfections existed in the tube, and fresh water flowed into the spring. It was therefore necessary to retube it, which was done in March, 1866. This last tubing seems to satisfy the proprietors, who are now bottling the water, and exporting it in considerable quantities.

EXCELSIOR ROCK SPRING.

This fountain is one of ten mineral springs, situated about one mile east of Broadway, and on the farm of the late Henry Lawrence, Esqr., of Philadelphia.

Several of these springs, and the Excelsior among the number, were indifferently tubed by the Brothers Taylor at an early day in the history of Saratoga. These tubes being imperfectly set, fresh water continued to mingle with the mineral, and the efforts made for reclaiming the fountains, were therefore unsuccessful. Similar attempts were afterwards made to reclaim the Excelsior Spring, and with corresponding results. But in 1859, Mr. Lawrence excavated a shaft ten feet in diameter and fifty-six feet deep, through loam, clay, hard-pan, and slate down to the Trenton limerock, when the mineral water from five different points, flowed into the well. Six feet above the bottom of the shaft, a platform made of matched plank was thrown across the shaft, and supported upon a ledge, two feet wide, cut into the sides of the shaft. Through the centre of this platform an opening thirty inches square was made, over which was placed a tube forty-six feet in length. The shaft above the platform was filled with clay, carefully packed about the tube. The tubing being completed, the mineral water rose within the curb and flowed over its top. Mr. Lawrence also built a simple, but neat structure over the spring, and opened a carriage way leading from it to the public highway. The water of the fountain is abundant and well charged with mineral substances. It

bottles without sediment and is rapidly gaining public favor. One gallon gave the following ingredients:

	Grains.
Chloride of Sodium,	370.642
Carbonate of Lime,	77.000
Carbonate of Magnesia,	32.333
Carbonate of Soda,	15.000
Silicate of Potassa,	7.000
Carbonate of Iron,	3.215
Sulphate of Soda,	1.321
Silicate of Soda,	4.000
Iodide of Soda,	4.235
Bromide of Potassa,	
Sulphate of Strontia,	
Solid contents,	514.746
Carbonic Acid,	250.000
Atmosphere,	3.000
Gaseous contents,	253.000

EUREKA SPRING.

This fountain is situated about one mile and a half east of Broadway. Its surroundings are not surpassed in beauty by any other portions of the mineral valley. The gorge is wide and varied in its outlines, while bluffs of modified drift rise more than a hundred feet upon either side of the deep ravine. Spring brook is here increased in width with a free current flowing around the jutting points of the different slopes of drift, which are dotted with forest trees and shrubs. These natural beauties added to the mineral spring rising from the south bank of the stream, make it one of the most attractive places about Saratoga.

If the owner will take advantage of these natural beauties, arrange pleasant walks and good carriage ways from the Ten Springs and lake Avenue, he may make this spot to Saratoga, what the Central park is to New York city.

One gallon of this water furnishes

	Grains.
Chloride of Sodium,	95.321
Carbonate of Soda,	5.000
Carbonate of Lime,	23.612
Carbonate of Magnesia,	19.560
Carbonate of Iron,	3.000
Iodide of Soda,	2.000
Bromide of Potassa,	0.342
Silica,	0.361
Alumina,	0.180
Strontia a trace,	
Sulphate Magnesia,	1.231
	150.607
Carbonic Acid	105.000
Atmospheric Air,	1.000
Gaseous contents,	106.000

REED'S SPRING.

This mineral fountain is situated in South Argyle, in the county of Washington, and is in the most easterly group of the mineral range.

It is an acidulous carbonated water, and rises through a fissure in a stratum of limestone.

The gas rises from the bottom of the shaft in occasional bubbles; but the water is not highly charged

with it; nor has the spring the lively and sparkling appearance, which is so striking a feature in the Saratoga fountains.

The slight acidulousness of the water, imparts to it a pleasant taste, and makes it a grateful beverage.

When the water is mixed with flour, it acts as yeast, making it light and spongy, and is therefore sometimes used in baking what are called "spring-water rolls," and is also employed by persons residing near it, for medicinal purposes. This is also the case with the Saratoga Springs.

WHITE SULPHUR SPRING.

This spring is situated on the east side of Saratoga lake, about half a mile south of Snake hill, in a beautiful ravine of a few rods in width, through the centre of which runs a small stream, supplied by fresh water springs issuing from either bank. Within twenty rods of the lake, a niche is formed in the south bank. Near the centre of the niche, and at the base of the bluff, rises the Sulphur Spring, and its course to the brook is marked by a deposit of sulphur. The water is strongly charged with sulphuretted hydrogen gas, and is very pellucid. Its taste, like other waters of the class, is very offensive to those unaccustomed to drink it. A few years since a number of gentlemen from the village purchased the farm in which the spring rises, sunk a shaft, and adjusted a new tube, built baths and other accommodations for the use of visitors, and placed a steam boat

on the lake to ply between the Lake house and the spring, which made two trips daily. Two or three years subsequently, the building took fire and burned to the ground; the year following the boat was removed from the lake, and all the arrangements which had been made to bring the sulphur water into notice have been, for the present suspended.* Since the loss of the boat and the burning of the house, a bridge has been thrown across the outlet of Saratoga lake, and now, if a road should be constructed along the lake shore to Snake hill, and thence to the Sulphur Spring, it would be immediately brought within practicable distance of the village, and a new and beautiful drive of three hours would be opened.

CHAPTER IV.

CHLORIDE OF SODIUM is distributed very generally over the surface of the globe. The ocean, seas, salt lakes and mineral springs, hold large quantities of it in solution, while Russia, Germany, Poland, Hungary, Africa, Spain, England, and South America, furnish large deposits of this salt in a fossil state.

There is a fossil deposit in Nantwich, Cheshire, England, which will illustrate this mineral formation, in the state of rock salt.

*Another steam boat has since been placed upon the lake, and regularly plies during the summer season, between the bridge and the Sulphur Spring.

This salt formation lies one hundred and sixty miles northwest from the city of London, on the banks of the river Weaver, near the confluence of that stream with the Don. It extends over parts of the townships of Willan Castle, Nantwich, Winnington, Marsdon, Liffwick, and Anderton. At Nantwich, there is one mass of this salt, which is sixty-five feet thick, three thousand nine hundred feet wide, and a mile and a half long; supplying annually sixty thousand tons of salt, which are conveyed thence to Liverpool by the Weaver and Mersey. Under this fossil are salt wells, varying in depth from ninety to one hundred and twenty feet. From these wells alone forty-five thousand tons of salt are annually procured by artificial evaporation, which is also marketed in the city of Liverpool.*

Other portions of the county supply fifty-one thousand tons; making in all, one hundred and eighty-six thousand tons of salt exported from a single fossil deposit. If this may be accepted as a specimen of the productiveness of rock salt formation in general, immense quantities of this substance must exist on the surface of the earth.

But large as this estimate makes the quantity of saline deposits in the interior of the earth, yet it represents but a small portion of the aggregate of this substance contained in ocean, seas, lakes, &c., all of which vary greatly in the strength of their solutions.

It is found, as is well known, in the fluids of the animal system, supplied doubtless by their food. A

*U. S. Dispensatory.

certain amount of this substance seems to be necessary for the healthful condition of animal life, though an excess of it occasioned disease, as is noticeable in the fact, that persons long at sea, who eat but few vegetables, and use salt meat freely, usually suffer from scurvy. A disease not unlike scurvy, and produced by the same cause, is not uncommon on land.

When taken into the stomach it may act as a tonic, cathartic, diuretic, emetic, and antiseptic, its effects being determined by the state of the system at the time it is taken, and the quantity used. Saline baths are particularly appropriate for persons with a relaxed, moist skin, and for children of scrofulous habits and low nutrition. One pound of salt to four gallons of water is a suitable solution for this purpose. It is soluble in twice its weight of water at 60° Fah.

As an antiseptic, chloride of sodium or common salt has been long known, and very generally used. Fish and flesh are preserved by it for long periods of time. In the year 1805, there was a piece of beef in the Leverian Museum, London, which was a remnant of the provisions taken by Lord Anson, on his voyage "around the world," between the years 1739 and 1744.

In agriculture, salt has been used as a fertilizer, on dry lands. As it is deliquescent, attracting water from the atmosphere, it thereby, in part, supplies the deficiency of moisture in the soil.

The quantity of this salt obtained by evaporation from a given amount of any of the mineral springs at Sara-

toga, is equal to more than one-half the sum of all the salts contained in them.

It occurs, geologically, in the secondary formations, associated with gypsum, slate, clay deposits, limestone, and red sandstone.

Although the United States contain no deposits of fossil salt, so far as we know, yet brine springs are numerous in this country, and some of them are among the most celebrated in the world. Those of Salina, Onondaga county, N. Y., are justly distinguished. They hold in solution 19 per cent. of this salt. The state of New York draws a part of her revenue from the manufacture of salt at Salina, and annually employs several thousand persons about the works.

Thirty-three and one-quarter gallons of Salina water will furnish a bushel of salt of the ordinary marketable dryness, while at

Nantucket,	350	gallons	make	one	bushel.
New York,	300	"	"	"	"
Boon's Licks, Mo.,	460	"	"	"	"
Connaugh, Penn.,	300	"	"	"	"
Zanesville, Ohio,	95	"	"	"	"
Salina, N. Y., (new springs),	30	"	"	"	"

In the year 1841, 3,134,317 bushels of salt were inspected at the Onondaga salt-works.* In the arts this salt is much used in the manufacture of carbonate of soda. Its existence in the mineral waters of Saratoga was demonstrated by Valentine Seaman in 1809.

CARBONATE OF SODA.— This salt was first called Natron, from the name of the desert from which it was taken. When it exists as a solid it is called native soda.

* Geological Reports of New York.

It is chiefly found in Egypt, Hungary, and South America, where it occurs principally in lakes, and small ponds, from which it is taken in a state of solution, and evaporated by the sun.

Soda has been obtained by the incineration of marine plants. In Spain, these plants have been cultivated for the purpose of procuring carbonate of soda; and the best quality has been obtained from the barilla thus produced; kelp is another form of impure soda, which is obtained also from the ashes of marine plants; but the salicornia, from which an impure form of soda is obtained, grows on the rocky coasts of many countries — as Wales, Scotland, and Ireland.

The salt is colorless, possesses an alkaline reaction, and a disagreeable taste. It effervesces with acids, is soluble in about two parts of cold water, and in a blaze of alcohol it burns with a yellow flame, its usual impurity is common salt, which is easily detected by a solution of nitrate of silver. But at the present day, it is more generally procured from common salt than from marine plants. Medicinally, it is used to correct an acid condition of the secretions — as gout, gravel, and certain forms of dyspepsia. It has been used also in whooping-cough, bronchocele, and scrofula. Dr. Perchier, at Geneva, considers it preferable to iodine in the treatment of bronchocele.

In diseases of the skin, where a papulous or scaly state of the surface exists, it is administered in doses of from ten grains to half a drachm in some bitter infusion. An overdose acts as a corrosive and irritant poison; the

antidotes are olive oil, acetic acid, or lemon juice. A proper strength for a lotion, is from ten grains to three drachms to a pint of water; and for a general bath, eight to sixteen ounces in about ten gallons of water. The ointment may be formed, varying in strength from eight to sixty grains to one ounce of lard, according to the case. It was detected as a constituent of the Saratoga mineral water in the year 1795, by Dr. Vandervoort of New York.

CARBONATE OF LIME.— This substance is widely spread through many of the surface rocks, and appears in some one of the various forms of spar, and common and shell limestone, marble, marl and chalk, and in the surface water of all limestone countries, and enters largely into the composition of the shells of fishes. In the form of limewater and prepared chalk, it is frequently used to correct acidity of the stomach occasioned by weak digestion. It is decomposed by heat and the acids, also by potassa, soda, baryta, strontia, and by acidulous and metallic salts. Dr. Vandervoort demonstrated its presence in the Saratoga water in the year 1795.

CARBONATE OF MAGNESIA.— This substance was discovered in the beginning of the eighteenth century, and was sold in the shops of Italy as a secret remedy, possessing of course, great curative powers, under the imposing name of Count Palmer. But in 1755, Dr. Black examined it, and clearly demonstrated its chemical composition.

It exists largely in nature, and is one of the four

earths forming so considerable a portion of the crust of our planet. It is principally derived from the bitterns in salt pans after the crystallization of common salt; and Scotland, New England, and Baltimore are celebrated for its manufacture. It is sparingly soluble in water, but is more so at a temperature of 60° than 212° This is owing to the partial expulsion of the carbonic acid by the excessive heat of the water, which renders it partially soluble in that menstruum.

As a cathartic, carbonate of magnesia is very generally used in cases of weak digestion, and in cases of an acid stomach it produces most salutary effects. The morbid acids of the stomach and bowels decompose the carbonate of magnesia, and, forming other salts of magnesia in the bowels, leave the carbonic acid in a free state in the first passages; this is most acceptable to these organs even when in a sensitive and irritable condition.

These soothing properties render it very applicable to debilitated adults, and in many diseases incidental to childhood.

As a lithontriptic, it has been prescribed to prevent the formation of calculi when the uric acid predominates.

It is an antidote to poison by arsenic, and nitric and sulphuric acids. Its existence in these waters was first determined by Dr. Vandervoort, of New York, 1795.

CARBONATE OF IRON.*—This salt of iron has been long known, and is widely distributed through the mine-

* Detected as a constituent of the Saratoga Mineral Water in 1795, by Dr. Vandervoort.

ral, vegetable, and animal kingdoms, probably, in part, giving the varied tints to the petals of flowers, and coloring the globules of the blood of man and other warm-blooded animals. It is powerfully tonic as a medicine; it raises the pulse, promotes the secretions, and it being one of the ingredients in the mineral waters of Saratoga, of course adds greatly to their value as alteratives.

Professor Emmons discovered phosphate of iron in the water of the Empire Spring. This ferruginous salt is an important medicine when prepared by the chemist.

IODIDE OF POTASSA.— Iodine was first discovered by Courtois, a manufacturer of saltpetre in Paris, in the mother water of sea-weeds. As a medicine, it has been very much used since 1812, and at the present time is variously compounded, and enters largely into the most important prescriptions of modern times. This substance was discovered in the water of the Congress Spring by Dr. William Usher, and his discovery was published in the American Journal, No. 1, vol. 15.

Dr. John H. Steel detected iodine in all the Saratoga waters in the year 1828, and 1829 published the fact in the succeeding volume of the same journal. It excites strongly the glandular system, and possesses great alterative power. It has since been found that they contain even more grains per gallon than the celebrated baths of Lugol.

BROMINE was discovered by Bolard, of Montpelier, in France, while experimenting on the water of ponds, and from its unpleasant odor he called it bromine. It has been used as a medicine since 1829. Like iodine, it

is found to exist quite uniformly in sea water and in salt springs, in both Europe and America. In America it was first discovered by Professor Silliman, of New Haven, in water of the salt springs of Salina, Onondaga county, New York, and in the mineral waters of Saratoga, by A. A. Hays, of Connecticut. Its action on the animal system is nearly the same as iodine, and may be in some cases substituted for it; but, as it is a more active remedy, it is not so generally used.

The just named minerals, are among the most important of our medical agents; and perhaps there is not one of the number which does not enter into the daily prescriptions of every physician in full practice, whether in the city or country. They are rarely, if ever, prescribed alone, but must be either artificially mixed or variously combined with other substances. These combinations must vary at times from the nature of the case, whereas in these waters, combination is so uniform that results may be exactly calculated and depended upon.

Hence, doubtless, if these waters were administered with the same care which is generally allowed to be necessary in the administration of artificial compounds, the benefit of them would be greatly increased. One of the errors daily committed in their use, is the excessive quantity taken. Permanent injury is often done in cases where, if properly used, they would be attended with most salutary effects.

CARBONIC ACID has more volume than any other mineral found in these springs, and it is more generally diffused than any other mineral substance known to

science. No height of the atmosphere has failed to give evidence of its presence, when it has been subjected to appropriate tests; no depths of the earth unfolded to man, have failed to present this peculiar mineral, either in a free or combined state, and the rocks found most universally on the surface of the earth are carbonate of lime. Vegetables cannot grow without it, and the animal kingdom is equally dependent on its presence.

It has been called gas of wine, because found in this fluid, and was at one time named choke damp, because it produces spasms of the glottis when attempts are made to inhale it. One chemist, having disengaged it from a piece of chalk, calls it cretaceous air; another detects it in every portion of the atmosphere, and he names it aerial acid; and, finally, the analytical chemist separates it into its constituent parts, and demonstrates its chemical composition to consist by volume of one part carbon and one part oxygen gas. This philosopher, therefore, designates it carbonic acid, and by this name the chemist knows it at the present day. It is pleasant to the taste, slightly pungent, imparting an agreeable flavor; it has a healthful influence when received into the stomach, by taking the place of other acids, and changing the chemical compounds which are the result of impaired digestion. It acts chemically when it corrects the acids and gases which result from indigestion, and as a sedative when it allays the nausea and vomiting which attend irritation of the organ. Its effects on irritable mucous surfaces have been noticeable and very beneficial. Professor Moyon of Geneva, Switzerland, used it in case of dysmenorrhea, with the most soothing effects. It is irrespira-

ble, even when it is inhaled with the atmosphere in the proportion of one part of gas to nine of air, it becomes a narcotic poison by producing stupor, insensibility, and death. But it imparts the sparkling, lively appearance to champagne, beer, cider, and the soda water of the shops.

The mineral springs of Saratoga produce large quantities of this gas, and the tubes are always filled with it above the water, and experiments upon animal life may at any time be made here.*

Combined with water, it forms a grateful drink to febrile patients, allaying thirst, lessening nausea, gastric irritation, and increasing the secretions of urine. It has been prescribed for gravel and urinary calculi with good results.

Its specific gravity is 1.521. This quality of the mineral, favors its accumulation in caverns, wells, and other low situations, near which it is generated, if unoccupied by water. Its presence in such places may, as is well known, be detected by lowering a lighted taper, which in this gas will be extinguished immediately.

Water under the pressure of the atmosphere holds one volume of this gas in solution, and if the pressure is increased, the quantity of the mineral is correspondingly accumulated; and on again diminishing the pressure to that of the atmosphere, only the gas escapes with active effervescence.

The mineral water at this place holds more than one volume of carbonic acid in solution. It therefore must

* In 1864, a strong man in attempting to fill a pitcher from the Pavilion fountain, put his head into the tube and lost his life, by inhaling the gas.

have been subject to a pressure greater than that of the atmosphere, and on rising to the surface of the ground, this extra pressure is removed and the gas escapes, giving a simmering or a boiling motion to the surface of the water in the spring.

In the year 1823, Faraday subjected carbonic acid to the pressure of thirty-six atmospheres, and a fluid was produced. This liquid gas is also colorless and exceedingly mobile, having a specific gravity of 0.83 at the temperature of 32° Fahr. And in 1836, Thilosier solidified it by taking advantage of the cold which was generated by the sudden gasefaction of the liquid acid. When a solid it is a white, filamentous body, something like asbestos. This gas is soluble in ether; and by the evaporation of this solution, the most intense cold, viz., 160° Fah., has been obtained. Carbonic acid gas is very sensibly affected by heat, so that the temperature which would increase the volume of air once, will increase that of carbonic acid four fold.

When this mineral is dissolved in water, it very much increases the solvent powers of that menstruum, enabling it to take up and hold in solution, lime, magnesia, and iron, in greatly increased quantities; hence the variety of constituents in the mineral fountains of Saratoga. And, if one ounce of the mineral water be evaporated, salts will be precipitated which would not be redissolved by gallons of common rain water.

The presence of this gas in the mineral water of Saratoga increases its solvency about one-third. The phenomenon of the High Rock Spring will be seen to illustrate this fact.

Besides the sources already mentioned from which this gas is derived, as the atmosphere, combustion, growth and slow decomposition of vegetables, decomposition of calcareous rock, fermentation of saccharine matter; it is also a result of volcanic action. This gas is also evolved in great quantities from all the mineral springs lying along this mineral range.

That an immense amount of gas is contained in these springs is obvious. That it is freely imparted by them as soon as they are subjected to the pressure of the atmosphere alone, is equally well known. But the great question which has thus far been, and perhaps may long be *unanswered*, still remains: By what process, and at what depths of the earth's crust, have they become thus freely charged?

Several theories have been advanced to account for the origin of carbonic acid in mineral fountains, as volcanic, chemical, &c., &c.

It has been supposed by some, that the gases which occur in different fountains, are derived from the rocks which form the channels of subterranean water courses. This supposition of the source of the gases is farther strengthened by the fact, that gases differing in kind, have been obtained at different depths in the same boring, as in the Ferry street well in the city of Albany. In this instance, at the depth of thirty feet, sulphuretted hydrogen gas was found, at four hundred feet carburetted hydrogen was obtained, and at four hundred and eighty feet carbonic acid, free, and also combined with soda, magnesia, and iron came sparkling up, nearly to the top

of the well. The boring was continued to the depth of six hundred feet from the surface; but the same kind of mineral waters continued to flow, charged with gases. These could be separated by tubes introduced into each other, so as effectually to separate the three several kinds of water occurring in the same shaft.

If these gases had been the product of volcanic action, would they not have appeared together at the different heights in the same boring, and could they have been separated, as was done in the Ferry street well?

Others have accounted for the gas in the fountain by the reciprocal action of *sulphuret of iron, and carbonate of lime*, contained in the strata of argilite in which they exist; but admitting this origin for the gas, it is not easy to account for the absence of sulphate of lime, of which not a trace has been discovered in the waters of Saratoga.

An opinion is entertained by some chemists, that in strata holding alkaline and ferruginous carbonates in combination, free carbonic acid and alkaline carbonates may be found in solution. The theory of slow molecular action seems to be attended with fewer difficulties, and accounts equally well for the abundant production of carbonic acid in this locality. And there can be but little doubt but it is an important agent also in elevating the mineral water of this region to the surface of the earth. For it has been observed that in all cases of tubing these fountains, the gas does not rise in the springs until some hours or even days after the water has reached its maximum height. Then it begins first to simmer in a very slight and feeble way, gradually increasing, till at length the surface of the fountain is agitated like water

in a boiling cauldron. And if, by any cause, the pressure of the column of water within the tube is increased, the gas will cease to rise for a time, but will appear again as active as ever, after the gas has had time to accommodate, and adapt itself to the additional pressure.

It has been objected, that if this process is going on, mineral springs should occur more frequently. It may be said in reply, that they are very much more common than is generally supposed, inasmuch as forty-four counties of the state of New York furnish mineral springs. Water, next to atmospheric air, is the most abundant and most generally diffused fluid in nature. Its solvent power is such, that it is rarely found pure. As it expands into vapor by the influence of heat, it rises into the air, where it comes in contact with oxygen, nitrogen, carbonic acid and ammoniacal salts. These it dissolves, and when the vapor condenses into rain, hail, or snow, it still holds them in solution, and returns them to the ground. These substances are thus particularly well prepared for food for plants; and hence the invigoration and rapid growth of vegetation which invariably follow gentle falls of rain and snow in the late spring. And so obvious is this effect even of a late snow, upon the growth of vegetation, that farmers have called it the "the poor man's manure." It is tolerably well understood that the artificial irrigation of plants does not produce results nearly so desirable, and hence we are led to the supposition, at least, that water holds its combinations in a manner quite different, whether falling in showers, running in springs, or standing quietly in vessels; though it may be true, as has

sometimes been supposed, that these combinations are in each instance the same, in kind and proportion.*

When the water percolates the soil, or runs deep among the rocks which compose the crust of the earth, it comes in contact with a great variety of minerals, acids, alkalies, and fossils, dissolving a portion of each. These substances are thus conveyed in solution to the ocean, where the water is evaporated, and the salts are precipitated. In this way a constant increase of earths, minerals and salts is taking place in the great reservoirs of the globe.

Thus, perhaps, have been excavated the large caves common in limestone formations. The water having always more or less carbonic acid in solution becomes an active solvent of lime, and when brought in contact with it, takes it up from the surface of the rock, thence it flows off; but if the temperature be raised the lime is precipitated; hence the stalactites, stalagmites, &c., so abundant in these localities.

When water, percolating through the surface of the earth, meets some impervious stratum, it is accumulated upon it until it rises to such a level as to find an outlet. This outlet is called a spring.

When springs differ from ordinary water in containing a larger proportion of saline ingredients, with various gases in greater or less quantities, they are called mineral springs.

By acidulous or carbonated springs, we mean those

*The changes which take place in the character of the solutions of water under different circumstances, might become a subject of curious inquiry.

fountains which are charged with carbonic acid. They have a peculiar, sparkling and exhilarating effect, and contain always some alkaline carbonate as one of the constituents.

To this class of mineral springs belong the well known fountains of Saratoga. This kind of mineral water is not very common, and in the state of New York has been only found in the mineral range already described.*

CHAPTER V.

EVACUANT.—As a general evacuant in cases of long standing debility and depraved general health, I know of no remedy, either simple or compound, which can be compared with these mineral waters, if judiciously used and persevered in.

As a cathartic they are pleasant to the taste, grateful to the stomach, efficient as an evacuant while they leave the alimentary canal stronger, and its functions more vigorous. Patients whose digestive organs have been impaired by disease, enfeebled by excess, or exhausted by the toil of accumulated years, find in them an agent which will relieve the organs, without first increasing the existing debility. When taken in the morning upon an empty stomach, in a potation from half a pint to three pints, a full and copious dejection soon takes

* See page 31 in this work.

place; unloading the whole length of the digestive tube of the remnants of the previous day's ingesta, which is of no farther use to the system, but on the contrary, may be the source of much harm. This free evacuation is copious, without pain, and leaves the digestive tube at perfect freedom to exert its digestive and assimilating powers on the next portion of food presented to it.

And although the dejections are free, and in many instances most copious, yet no languor or debility is experienced by the patient, but on the contrary, his appetite is increased for the next meal. Even the digestive functions are greatly improved, the power of assimilation and nutrition is increased, additional strength is imparted to the body, and as a consequence, new and increased vigor to the mind.

DIURETIC.—As a diuretic they are no less happy in their results, in cases proper for their use, than as a cathartic. For their action on the kidneys, and the general renal secretions, is prompt, certain, uniform and efficient. But they must be differently administered when diuretic effects are to be obtained; the quantity taken at a time should be less, and repeated at shorter intervals, and if possible the water should be drunk fresh from the fountain.

DIAPHORETIC.—As a diaphoretic they are equally successful as an evacuant. And very many cutaneous diseases find ready relief from an alterative course of them. In the case of those who have resorted here for relief, and have come under my personal observation, a very large proportion of them have had an exceedingly

bad functional state of the skin; and oftener than otherwise, if there had been any error committed by their medical adviser at home, it was not sufficiently regarding this great depurating organ. The bowels had been purged, the functions of the kidneys inquired after; but those of the skin had never been thought of either by the patient or his physician, and this neglect carried sometimes even to the lack of ordinary cleanliness.

In this connection I wish to correct what seem to me to be errors in the minds of many people, viz.: that physic will cure constipation of the bowels, and that a very free state of the first passages is necessary to health and comfort. Now, both of these positions are undoubtedly wrong. Physic is an evil, and is to be taken as a choice of evils when taken at all. It must interfere with digestion, and all the legitimate functions of the digestive and assimilative organs, by exhausting to a greater or less degree their vital powers so that they are less qualified to prepare nutriment for the individual. A free state of the bowels is an unnatural state of the organs, and the food passes from the digestive tube before the absorbents have had time to take up the nutriment. And a majority of the mineral water drinkers physic themselves too much. A healthy action of the bowels is all that is required; and all extremes are to be avoided. Constipation is only to be cured by checking those functions which are in excess, and properly correcting the secretions and stimulating the muscles of the bowels. A relaxed state of the bowels is to be remedied by increasing the secretions of the kidneys and the skin, and regulating the diet.

BILIOUS DISEASES.— In those cases where the liver is making bile, unhealthy in quality or quantity, but without organic lesion, these waters, used as a cathartic in the morning, with such assistance over night as the case may require, produce the most happy results. But if a higher grade of arterial action is present, or if organic lesion has taken place, and a dropsical state of the lower extremities has supervened, then they are injurious without an exception. But it must be remembered, that extensive swellings may take place from a great variety of causes besides organic disease, which may be relieved with great facility by a proper and timely use of these mineral waters.

In a passive state of the bowels, when an evacuation is only obtained after much time, or large doses of active medicines, with clay-colored stools, and a dry and rough state of the skin, the cathartic mineral waters, taken in the morning an hour or two before breakfast, in proper quantities for physic, and in smaller portions through the day, to operate on the kidneys, skin, and liver, will in a few days regulate the system most perfectly. But in bilious difficulties of the above description, much relief may be obtained by proper and timely bathing. These baths should be of mineral water generally, and used in the form of a shower-bath, about ten or eleven o'clock in the morning. After the bath, it is important that the patient should be carefully wiped dry, and the friction on the surface continued with a coarse towel, or a flesh-brush, until the skin is warm and generally flushed. This rubbing should in most instances be done by the patient himself, for the circulation is thereby

thrown upon the surface, and the congestion of the internal organs more effectually relieved. In some of the above cases, I have known such an active state of the kidneys or skin to exist, that almost all the fluids of every description which the system could receive, would be passed directly from the body by the agency of the renal organs, or the pores of the skin. And notwithstanding large quantities of mineral water had been taken by the patient, yet the constipation would continue to be more and more difficult to overcome, the torpidity of the bowels more and more aggravated, and the long and unpleasant train of morbid action incident to an excessive secretion of the kidneys or of the skin, also superadded to former sufferings, by the very course resorted to for relief. This state of the system is easily overcome by proper medicine taken over night, followed in the morning by cathartic water, together with bathing and friction of the skin. In other cases again, there may be a little general excitement, which will be so much enhanced by the carbonic acid, that it becomes necessary to expel it before the water is taken. This is usually accomplished by setting the water in the lodging-room over night, or by immersing it in warm water in the morning just before using it; this will expel the gas and insure the cathartic effect by adapting it to the state of the system.

ALTERATIVE USE OF THE WATER. — When the cathartic effects are obtained by the use of the water, many people seem to think the work is completed, and they of course expect to be well, when in truth they have taken but one step toward a permanent cure. They

have, by an antiseptic physic, evacuated the first passages of ill-prepared feculent matter. But the water has passed through the bowels, and scarcely any of it has entered into the system proper, or passed the secreting organs, and become a part of the circulating fluids of the body, or combined with their nutriment. This is only to be done by small potations taken repeatedly through the day; and in most instances these draughts should be taken from the more tonic springs, as the Columbian, Hamilton, and the High Rock fountains.

The quantity of water taken in this way should be small at first, say a gill or half a pint for delicate females, and others in proportion, and should be repeated every three or four hours throughout the day, and gradually increased in quantity until the maximum amount the system can dispose of properly has been reached by the patient. In this way an alterative course is obtained, which may change the whole secretions of the body; a very important point to be obtained in most cases of chronic disease.

The small alterative potations should be drunk at the fountains, where the water is as perfect as it is possible to obtain it.

GRAVEL.— In a gravelly state of the kidneys and the bladder, many well-attested cases might be produced, where the patients have been cured by the waters from these mineral springs. They should be drunk in such quantities, and with such repetition as to insure a copious diuretic effect, when large quantities of sand, and frequently small calculi will be discharged with the urine.

This result is frequently much assisted by the use of the warm bath, which, in a large proportion of the cases, will increase the secretions of the kidneys. And even in cases where there has evidently been organic lesion of the bladder present, the free use of the mineral water seemed to furnish more relief than any other remedy previously used, although the patient had been subject to the directions of the first medical men.

CHRONIC RHEUMATISM.—This formidable disease has been repeatedly cured by a free use of the water taken as a cathartic in the morning, as an alterative through the day, and externally applied in the form of a shower bath, cold from one of the mineral fountains.

PHAGEDENIC.—In ill-conditioned ulcers of the above character, these mineral waters have been found very beneficial, and are to be internally and externally applied. The external application, both general and local, should be prescribed, when, in a short time, the ulcers will change their aspect and begin to heal.

CUTANEOUS DISEASES — Diseases of the skin are very numerous, and some of them are difficult to treat in ordinary practice. But all those which depend on an acid state of the secretions, and which have been controlled by an alkaline treatment, are happily treated by the mineral water. These cases require the fluids of the body to be saturated with the mineral water, and also the daily application of the bath. Papulous diseases involving the whole surface of the body, are perfectly cured during one season by the use of these mineral waters.

SCROFULA.— This state of the system is greatly relieved by the use of the mineral waters of Saratoga. Those laboring under it should drink the water in the morning as an aperient, take it as an alterative through the day, and bathe regularly once during every twenty-four hours, unless some particular reason for the omission should exist. In these cases, the external application is highly important. Iodine and bromine occur in sufficient quantities in these waters, sensibly to affect such cases, when applied generally to the surface, and in amount even equal to the quantity used in baths with so much success in the south of Europe.

The temperature and frequency of the baths in these diseases, must depend upon the general health of the patient, the state of the weather, and the season of the year when they are used.

CHLOROSIS.— This disease and many other kindred difficulties, are readily removed by a judicious course of drinking and bathing in these mineral waters. But I have known some patients much injured by attempting to practise a course of diet, medicine and exercise, according to some popular direction, which may be very proper in some cases, but not necessary in all — as for instance, early rising, long walks, deep draughts of cold water; and all this, to be accomplished before breakfast by females, who for years have not risen in the morning until the breakfast hour; never have been accustomed to walk any considerable distance at any time in the twenty-four hours; with stomachs extremely irritable, and their general health feeble. For such patients to leave a warm

bed, subject themselves to the difference of temperature between it and the morning air about the fountain, and drench their stomachs with large portions of cold mineral water, then return to the hotel, and add to all the rest a full meal of stimulating food, must be a hurtful, if it be not a dangerous experiment.

By these remarks, I wish not to be understood as being opposed to early rising, exercising in the morning air, and drinking the water at the several fountains; but I mean to be understood as saying, that all persons who visit these springs in pursuit of health, cannot rise at the same hour in the morning, take a walk of the same length, drink the same number of tumblers of cold mineral water, and eat the same kind of food, and to the same extent, with precisely the same results. I mean that every person's exercise should be measured by his ability; his food by his power to digest and assimilate; that his rising in the morning, and the amount of water drank, where and at what temperature, should depend on the effects produced, rather than on the popular opinion of good, wise, or fashionable individuals, who have "known all about the water," because they had been here before, once or oftener, and had drank it by "rule."

PHTHISIS.— Much as has been said of late, about the effects of mineral water there in this disease, I have yet to learn that they have ever been of use in well-marked cases of this kind. And from those who have thought and written to the contrary, I must beg most respectfully to differ. I have never seen a case, where I thought

there was even a shade of palliation produced by the use of the water, but on the contrary it has been always injurious, increasing all the alarming symptoms of this most formidable disease.

I have however known many coughs and pains about the pectoral regions, most promptly and effectually cured by drinking the mineral waters, but the cough and the pains in the chest were dependent upon a diseased action in one or more of the digestive and assimilating organs, and not on that pathological state of the lungs which is *phthisis pulmonalis.* My advice to all who are laboring under this disease, is, not to drink of any one of our mineral springs whether recently or long since discovered.

Diseases peculiar to the Southern and Western states, and which are caused by miasma, are much relieved by a few weeks' sojourn at the Springs. The stimulating and dry atmosphere of Saratoga county is well calculated to remove diseases which occur in the damp miasmatic climates which prevail along the seaboard, and the lakes and the rivers of the Western and Southwestern states. And the morbid condition of the digestive organs, which so frequently attends bilious diseases, is often removed by the use of the water, because it acts powerfully on the secretions of the liver, the skin, and the kidneys.

Another class of patients which receive much benefit here, are those who have, by too close and protracted application to business, over-taxed the brain and nervous system. This class of patients can spend a few weeks at Saratoga, and be speedily relieved from their anxious cares and labors without becoming impatient of their

want of employment. The day passes, and the week even is gone, and they can scarcely account for it. Their time has been completely occupied, and yet they have had no particular business on hand at any hour. While the cause which produced their indisposition is removed, nature, aided by the wholesome atmosphere, the medical qualities of the mineral waters, and the congenial friends who surround them, restores them unconsciously to health.

DRINKING THE WATERS IN THE WINTER.—Although it has been the custom for half a century past, to use these mineral waters as a medicine during the warm seasons of the year, few comparatively have been induced to remain here during the colder portions of the year, to use the water as a remedial agent; but long experience has most clearly established the fact, that they may be used with nearly as much promise of success in the winter as at any other season of the year. It is true that July and August are the fashionable months at Saratoga, and many who reside in the large cities being compelled by the sickly season at home, to remove into the country for safety, make choice of these months for their annual visits. It is also an interval from active business, which is an additional reason for their making their annual tours for pleasure and health at this time. But a large proportion of invalids have not these restrictions for their annual visit, and might come in the cold weather as well as the warm if they were aware of the practicability of using the water during the Winter, Spring, and Autumn.

We have never been able to detect any difference in the temperature, specific gravity, or mineral composition of the waters during the winter months. They have their origin so deep in the earth, and so remote from the circulating currents of fresh water on the surface, that the fall and spring rains do not affect them in the least. The waters, therefore, are as medicinal during the three quarters of the year when they are not used at the fountain, as they are during the other quarter. Those who have used them during the winter with marked success, practically confirm the above conclusions, and were I called upon for some of the most striking instances of relief obtained by drinking the waters, I should refer to cases treated in the winter season, as among the most prominent. No distinction need be made, save with those who cannot endure the exposure of their journey. The *cases* in which the water is applicable, are the same, in the winter as in the summer.

CHAPTER VI.

BATHING means the immersion of the body, or a part of it, for a medicinal purpose in a medium different from that which commonly surrounds it. The medicine in general use is water alone, or water holding medicinal substances in solution. One of the most important things in a bath is its temperature. This ranges generally between 33° and 123° Fahrenheit. A bath can not be

used lower than 33°, for an obvious reason, nor can a higher temperature than 123° be employed with a probability of a medicinal effect.

For the purpose of practically arranging the temperature, Dr. Forbes has graduated it as follows : a *cold* bath, ranging from 33° to 60° Fahr. ; a *cool* bath, from 60° to 75° ; a *temperate* bath, from 75° to 85° ; a *tepid* bath, from 85° to 90° ; a *warm* bath, from 92° to 98° ; and a *hot* bath, from 98° to 112°.

When water of a low temperature is for a moment applied to the body, a shock ensues, but this is soon followed by a pleasant reaction. But if the immersion is continued for a considerable length of time, and the temperature of the surface again diminished, then a sensation of actual cold, with permanent tremors and shudderings ensues ; the extremities are benumbed, the person becomes languid, exhausted, and, finally, powerless. No glow succeeds this second chill. The face becomes shrunken, the extremities diminish in size, so that rings will frequently fall from the fingers. The pulse becomes small, and less frequent than natural, a feeling of oppression extends across the chest, and the renal secretions are increased. If a person leaves the bath before the accession of the second chill, or quite soon after, he will have a glow in ten or fifteen minutes, or even in less time ; the blood returns to the surface, the extremities recover their size, the stricture across the chest passes off, and a feeling of buoyancy ensues, with increased animal strength.

The prominent features to be noticed in the effects

above mentioned are the shock and the reaction. The chill may be so considerable, owing to a previously relaxed state of the system, as that the shock may result in death. The fluids of the body recede from the surface in consequence of the torpor of the nervous system, and hence the shrinking of the capillaries, which force the blood back to the interior of the body, into the substance of the large viscera, as the lungs, liver, &c. In the *reactory* process, the overloaded viscera are powerfully aroused by their crowded state, and the muscles of the parts are sympathetically excited, as well as the nervous system; increased heat follows; the fluids are returned to the surface, and the deranged functions are restored to order.

From the above statement, it will be seen that the effects of the cold bath are varied by many circumstances; particularly greater or less vigor, or high or low temperature of the system; hence the patient might be strengthened or weakened, benefited or injured, by it. And hence, too, the different opinions of physicians on the subject. One will call it a sedative, his friend will call it a stimulant, while another calls it a tonic. We know the cold is sedative, and if its continuance is sufficiently protracted, it will surely end in death. But when the *cold bath* is used in a proper time and manner, it acts as a tonic of the first class.

When the shock is the only object of the bath, the water should be used at a low temperature, applied with force and suddenness, and for a short space of time. The patient should be plunged into a bath, and immedi-

drawn. Swooning and hysteria are cases

where the shock is the only effect to be produced. The same application might be made in cases of maniacal patients.

REFRIGERATION.— To obtain this result the water should be but a little below the temperature of the body, but in continual contact with it until the effect is produced. In symptomatic fever, resulting from inflammation of one of the viscera, this form of application is contra-indicated, and unless used with great caution will be attended with extreme danger; but in cases of idiopathic fever, as the common, continued, or typhus fever, the water should be constantly applied by a sponge, and at a temperature but little below the heat of the body.

REACTION, all other things being equal, is in proportion to the cold. A sudden immersion produces a greater reaction than a gradual one; a plunge from a height produces greater reaction than a simple dip, however rapidly performed; and the water falling from a great height on the body, has more effect than water of the same temperature applied as in ablution. Within certain limits, that is, within any period short of that at which healthy reaction ceases, the amount of the reaction will be proportioned to the degree of refrigeration. The reaction will be in proportion to the heat of the surface at the time of taking the bath, allowing always for individual peculiarities of habit. Cool skin or cold extremities are not a proper condition to warrant the use of the cold bath. But the skin should be warm, and the circulation vigorous in the extremities, before entering the cold bath. Reaction is more certainly

produced when the bath is accompanied by muscular action, and hence a person swimming obtains a better glow, and more tonic effect, than he would if he were simply immersed in a bath, and continued in a state of repose.

Whatever prevents the surface of the body from falling below the proper degree of heat, or directly stimulates the skin, or excites the circulation, will proportionately increase the reaction. To insure this increased reaction we see the importance of speedily drying the body afterward, by strong and vigorous friction, and sometimes it may be necessary to use warm and stimulating drinks, or active bodily exercise. Unless the proper amount of reaction is secured the bath may be followed by increased coldness of the surface, and a congestion of some internal organ.

PLUNGE BATH.— The best time in the twenty-four hours for a plunge bath is on rising, when the system has been refreshed by a night's repose. The nutritive organs have then been active in invigorating and repairing the body, and as there is more recuperative energy, the reacting principle will be the more perfect. The next best time is about three or four hours after breakfast. And in case the mineral water is to be drunk, perhaps this time may be better than the early morning, but the physical exercise should be very light, and if the skin is at all moist, it should be well dried before entering the bath. The mode of entering the bath, and the length of time to remain in it, must be regulated by the shock, the reaction, and the second chill, as above described. From five to ten minutes is a medium time to

remain in the bath, and while in the water the limbs should be kept in motion. On leaving the bath the body should be dried as soon as possible with a dry towel, and then chafed with a coarse one, until a thorough reaction is produced, and a pleasant glow flushes the whole body. If a headache ensue, cold applications to the head would naturally suggest themselves. But with the above mentioned precautions, happy results will usually follow. These baths may be repeated daily, or every second day, according to the effect produced on the patient. The greatest danger generally arises from staying too long in the bath.

SHOWER BATH.— This bath differs from the plunge, in producing a greater shock, particularly if the quantity of water is great, its temperature low, and its fall considerable. In a shower bath the person is surrounded by the atmosphere, whereas, in a plunge bath, the body is surrounded by a menstruum much more dense than the atmosphere; the precordial distress will hence be greater than in the plunge bath. In case of fullness, and pain about the head, the shower bath is preferable to the plunge, inasmuch as the cold and the shock are applied directly and at first to the head. In case of extreme pains about the head, the feet may be put into hot water, while the cold shower falls upon the head, and thus the circulation is more speedily restored. A common bathing tub, with a fixture for a shower bath placed over it, answers a good purpose for this kind of bath.

SPONGE BATHS very nearly resemble in their effects

the shower bath. They are accompanied by a less shock, and therefore less reaction. The daily and free application of the water to the head, neck, and chest, on rising, is one of the simplest and surest tonics we possess, and is the best means of hardening the system against atmospheric changes, and preventing that unfortunate habit of "*always taking cold.*" This class of persons should be particular to bathe their feet, for their extremities are most of the time wet with a morbid perspiration.

THE DOUSE OR DOUCHE, is a small stream of water directed with considerable force from a tube, upon some part of the body. This bath varies in effect, according to the diameter of the stream, the temperature of the water, and the force with which it is thrown upon the body. This is an agent of great power, owing to the incessant and rapid change of the particles of fluid applied to the part to be affected. It may be used with great advantage in local inflammation.

THE HIP AND FOOT BATHS are but so many local baths. The former is employed in diseases of the pelvic viscera, and the latter to the lower extremities.

While upon the subject, it may be well to name some of the morbid conditions in which the cold bathing has been found to exert a thorough medicinal effect. It is generally applicable to youth and middle age. In infancy and old age it must be used with great caution. In cases of general debility, as in strumous habit, the cold bath, carefully applied, is followed by the happiest effects. When the skin is relaxed and flabby, and there

is a great tendency to perspiration, or to a cold clammy exudation, the cold saline bath is especially indicated. And again, when this state of the skin is accompanied by a catarrhal disease, the tonic cold bath is especially valuable, as also in nervous diseases, as chorea, hysteria, and some cases of epilepsy; also in the loss of certain functions, as the voice, smell, taste, &c.; local paralysis, unaccompanied by organic disease of the brain; in cases of nervous dyspepsia, unattended by inflammation of the gastro-intestinal mucuous membrane; and in the intervals of asthma, where the system is in a situation to produce the reaction.

TEMPERATE BATH is 75° to 85°. The effects of this bath on the system are of precisely the same kind as those of the cold bath, but less in degree. It is applicable to a different class of cases, from those for which the cold bath should be used. For persons not strong, and those who have an instinctive shrinking from the application of cold water; and when danger might result to some internal organ, as in cases of organic diseases of the heart, or a tendency to internal congestion, or when there is sensitiveness of the nervous system; in either of these instances this bath is to be substituted for the cold. The shock and the reaction are intended to be the same thing in kind, but simply different in degree.

WARM BATH.— The immediate effect of the warm bath is generally the opposite of the cold. The first impression of the warm bath is grateful, the whole nervous system is soothed, and a gentle languor steals over the mind. Slight pains, spasms and irritations are removed,

and general irritations is not unfrequently allayed in baths varying from 92° to 98°. If the temperature of the bath is increased, the tranquility is superseded by excitement and pain. If the heat be still increased, the feelings are painfully excited, and the temporary stimulus is followed by a proportional degree of exhaustion. The warm bath influences the system either by elevating the temperature of the whole body or a part of it. If the temperature of the parts of the body which come in contact with the medium, is higher than the medium itself, the body makes an effort to bring the medium to its own temperature, and vice versa. The range of temperature to which the body is subject is not a very wide one. While life remains, it is limited to a few degrees. In a bath the skin exhales and absorbs materials from the bath in a proportion varied by its temperature. At 50° the absorption exceeds the transudation; from 50° to 70° the two effects are nearly balanced; but from 70° upward the transudation exceeds the absorption, and the excess progressively increases with the temperature. Warm water modifies the texture of the skin, perhaps in part by absorption, and partly from a specific action on the animal fibre. This bath also regulates the circulation, and increases the volume of the whole person, as well as the amount of the fluids in the body. After long fatigue, as hard walking, riding, or any severe exercise, the body, as before said, should be left to cool, before going into the bath, which would be grateful to the patient. This is in general from 94° to 96°. After the fatigues of a few days' travel the skin becomes dry, the secretions are diminished, the blood is irregularly

distributed, the nervous system is excited, and a low slow fever frequently supervenes. Under this state of the system the warm bath is an appropriate prescription.

After long and continued mental excitement, as in protracted study, or the disturbance of the system by late hours, crowded rooms, and bad air, the warm bath is just the restorative required.

In a dry skin, with a chronic congestion of some internal organ, the bath is an appropriate remedy. It is also applicable to a more generally deranged state of the system, as in chronic nervous diseases of a spasmodic character, unattended by phthisis or inflammation of the nervous centres. Of this kind are croup and convulsions generally. Also in the treatment of nervous affections which occur in persons of spare habit, who suffer from pain disproportioned to the attending inflammation. Of this kind may be mentioned the numerous forms of neuralgia, including sciatica, lumbago, gastralgia, colic, spasms from gall-stones, calculi in the ureters, &c. In inflammation of the abdominal and pelvic organs, when the inflammation has been in a measure reduced, as in dysentery, diarrhœa, enteritis, cystitis, the bath at 96° or 97° is a useful remedy. Care, in these instances, must be taken to reduce the inflammation first, and then to use the bath not above 97°, or the disease will be aggravated rather than diminished.

The bath is also an appropriate remedy in diseases of the same viscera unattended perhaps by pain, but yet of a very annoying character. Such are those cases of gastro-enteritis accompanied by dyspepsia, constipation, also chronic irritation or inflammation of the bladder,

kidneys, leucorrhœa and the like diseases, which so frequently occur in the pelvic viscera.

In no cases are these baths more applicable, or attended with more prompt and happy results. For cases of dyspepsia, especially where the functions of the skin are deranged, its appearance altered, and attended by a fixed distress or pain in some part of the digestive organ, the bath is also one of the most important remedies; But it is also valuable in various chronic diseases of a cachectic kind, with derangements of important organs, a depressed state of the blood, with an irregular distribution of it, as in cases of long protracted dyspepsia, with constipation, diabetes, chlorosis, and gout. In this last disease the bath is to be used in interims between the paroxysms, and not during the acute state of the disease.

In diseases of the skin, either idiopathic or symptomatic, the warm bath is of the first importance. It acts directly on the part diseased, and removes the morbid secretions from the surface which are liable to irritate the organ, and to be reabsorbed.

The alkaline, astringent, and alterative medicines, are proper in these baths. In medicated baths the patient should remain not less than thirty minutes, and sometimes perhaps for two or three hours, in order to obtain the whole effect which is to be desired.

The temperature of a bath required for refreshment, must be between 93° and 98° Fahr. But lower than 93° is not often agreeable to the patient, and higher than 98° produces exhaustion and debility.

THE HOT BATH is a powerful, yet temporary stimulant to the nervous and vascular systems. It does not soothe or promote the natural actions of the system, but *excites* them irregularly and forcibly. It tends more to disturb than to equalize the functions of the organs. It violently excites the heart and blood vessels, the carotids swell and throb, the heat of the head increases, and headache, giddiness, and many other cerebral symptoms ensue; the skin becomes red and swollen by the great afflux of blood in its vessels. But this engorged state of the skin does not relieve internal congestion, as we might be led to expect, for experience teaches that contrary results more generally follow. The great tension of the surface is after a time relieved by a profuse and general perspiration, and if the bath is continued, although the pulse remain quick, the increased excitement is speedily followed by general lassitude and debility; torpor and somnolency supervene. Cases for its use are spasmodic cholera, agues, &c. In sudden recessions of diseases of the skin, as in measles, scarlet fever, impetigo, and enteritis, from retrocedent gout, &c., and in indolent diseases of the skin in paralysis, where there is no congestion of the brain to contra indicate it, its use has been beneficial. But it is a very active agent, and, like all other decidedly active agents, must be used with caution, or great and irreparable injuries may result.

The stimulating effects and the relaxing consequences constitute the value of this bath.

MINERAL WATER BATHS.— Without entering into the question of the actively absorbent power of the skin,

and the large amount of medicine which may be conveyed into the system by this great and important organ, it may be safely said, that the mineral baths have an effect very different from simple water. They are more tonic than one of ordinary water. The skin, weakened and relaxed by debility, exudes rather than perspires, and will be very differently affected by a fresh and a mineral bath. The latter beside accomplishing all that the former can possibly do, has in addition a stimulant and tonic effect. It will leave the capillaries of the skin more constringed, and the tissues of the whole organ more firm and vigorous.

In extreme cases of cutaneous disease, patients have been benefited by remaining several hours at a time in a warm bath, with repetition at short intervals, so as to be under its influence for ten or twelve hours out of the twenty-four.

From great indifference to the subject of bathing, the public mind has within a few years been turned to it strongly, and now perhaps there may be as much danger of excess as heretofore there has been from neglect. Extremes in all things are to be deplored and guarded against.

CHAPTER VII.

ROCK, FOSSILS AND MINERALS.

POTSDAM SANDSTONE.— This rock is interesting from the fact that it contains an early fossil, viz: the lingula. This fossil carries us back to the dawn of animal life on the earth, for it has been present through all the

changes which the earth's crust has undergone since the formation of the Potsdam sandstone to the present time. Each group, in every geological era, has a species of the lingula entombed in its rocks, and even the ocean is said to contain living specimens of the same species, which in due time will make part of the rock, which is now in process of formation at the bottom of the seas. This rock is called the paleozoic base,* and crops out about two and a half miles northwest from the village. It is gray, or brownish-colored rock.

THE CALCIFEROUS SAND ROCK is the next geological formation above the Potsdam sandstone. It lies between the last named rock and the limestone. This is the lowest rock which contains anthracite coal. In this instance, the coal is associated with quartz. This rock also contains fucoides, which are supposed to be the source from which the coal is derived. This is the surface rock at Saratoga Spring, and is the rock through which the *mineral water* rises. The upper layer of this group, or that stratum which lies next to the limestone, is hard; having a large proportion of silex, and frequently contains geodes filled with crystals of quartz. This rock furnishes but few fossils, some portions none at all.

OOLITIC ROCK.— This formation occurs in the calciferous group, and lies along the southern extremities of the Palmertown and Kayaderosseras mountains. The

* This base must hereafter be carried down to the Laurentian formation as the rhyzopod has been found in the lower beds of these rocks.

calcareous concretions which characterize this formation are arranged in successive layers through the stratum in which they appear. They are about the size of mustard seed, and globular in form. In some of the specimens, these globules compose one half of the stone.

THE TRENTON LIMESTONE group is composed of slate and limestone alternating with each other. Some of the strata contain fossils which characterize this group, and distinguish it from others higher in the geological series. This rock does not occur east of Schenectady, in the Mohawk valley, or east of Baker's Falls, in the Hudson river valley, but is found at Glen's Falls and at Rowland's Mills, two miles west of Saratoga Springs. It occupies the bank of the Mohawk, near Amsterdam, thence ranges northward into Saratoga county, thence eastward around the points of the mountain, and enters Warren county at Glen's Falls, and Washington county, near Sandyhill. The strata vary in thickness from four inches to two feet. This rock has been worked, and some of the varieties make very fair marble. Other specimens contain cherts and hornstone, and will not receive a polish. Large blocks of the marble, quite pure, are quarried at Glen's Falls, on the south side of the river. The Hudson river, at Glen's Falls, would seem to have worn a passage through the lime rocks, seventy feet in depth; and in some parts of the narrow gorge, between Glen's Falls and Baker's Falls, through which the river flows, the rocks on either side have a perpendicular height of more than one hundred feet.

UTICA SLATE.—This group consists of dark colored

argillaceous slate. It occurs at Baker's Falls, Cohoes Falls, Ballston Spa, and Saratoga lake. The rock is sometimes black, and highly carbonaceous, and glazed with anthracite.

So highly charged is this slate with carbon, that it has been mistaken for coal, and attempts (it is said), have been made to work the rock for that purpose.

THE HUDSON RIVER SLATE group extends from the southern line of the county of Saratoga, forming the bed of the Hudson to Baker's Falls, and also of the Mohawk, and forms in part, the elevated table lands lying back from both the Mohawk and the Hudson rivers. Portions of this group are singularly contorted at the Cohoes Falls, Visscher's Ferry, Alexander's Bridge, Upper Aqueduct and Snake Hill, on the east shore of Saratoga lake. The rocks of this group are slates, shales and grits, and have been called Greywacke slate, Greywacke shale, and Greywacke.*

HUDSON RIVER GROUP.— These rocks are found at Snake Hill, on the east shore of Saratoga lake, and on the Mohawk at the lower aqueduct.

The remaining rocks of the county are primary, occupying about two-fifths of the north-west parts of it.

FOSSILS.

The fossils in this county are principally found at Ashley's Quarry, Baker's Falls, Ballston Spa, Galway, Glen's Falls, Greenfield, Sandy Hill, Snake Hill, and Waterford.

*New York Geological Report.

ASHLEY'S QUARRY.

This quarry is situated about four miles west of the village, and on the road leading to Rowland's Mills, via Cady Hill.

The quarry may be seen a few rods north of the point where the highway crosses the mill-pond; and a small cluster of buildings in the same direction, and near by, will enable even a stranger to identify the place. The quarry has been considerably worked in times past, which increases the facility for obtaining fossil specimens.

The following fossils were obtained during the autumn of 1858, and no doubt a suitable effort will very much extend this list of such as are peculiar to the "Trenton Limestone Formation:"

Asaphus latimarginata,
Atrypa acutirostra,
Atrypa extans,
Atrypa increbescens,
Atrypa modesta,
Atrypa plena.

Buthotrephis flexuosa,
Buthotrephis succulens,
Capulus auriformis,
Chætetes Lycoperdon,
Columnaria alveolata.

Glyptocrinus decadactylus,
Graptolithus ramosus,
Graptolithus scalaris,
Graptolithus sagittarius.

Heterocrinus decadactalus,
Illænus crassicanda.

Leptæna alternata,
Leptæna fasciata,
Leptæna sericea.

Orthoceras anellum,
Orthoceras junceum,
Orthoceras laqueatum.

Palœphycus rugosus,
Pleurotomaria turgida,
Poteriocrinus alternatus.

Retepora incepta,
Retepors gracilis.

Schizocrinus nodosus,
Scyphocrinus heterocostalis.
Stictopora acuta,
Stictopora fenestrata.

BAKER'S FALLS.

These falls are in the Hudson river, about twenty miles north-east of Saratoga Springs. The more feasible

way to reach them, is by railroad from the Springs to Moreau Station, and thence by stage to the Falls.

The fossils occur in a stratum of the Utica slate, is about thirty feet in thickness, and which is literally composed of fossil impressions, remarkably well preserved.

On the east bank of the stream the rocks are more upturned and displaced than upon the opposite bank, which is therefore the better place to collect fossil specimens; besides, the rocks on the west bank are more horizontal, and unless the water is very low, are generally covered.

Among the fossils to be obtained at this locality are the

Graptolithus secalinus, Graptolithus pristis.

BALLSTON SPA.

The fossils of this locality are to be found in the village of Ballston, about seven miles south-west of Saratoga Springs. The rock which contains them is the Utica slate, and forms the bed of a small stream near the residence of the late Hon. John Taylor.

The fossils are the

Graptolithus bicornis, Graptolithus ramosus,
Graptolithus pristis, Graptolithus serratulus.

GALWAY.

This locality is about two miles east of Galway Corners, and near a lime kiln, and fourteen miles from Saratoga. The rock is the Trenton limestone, and the casts of the

fossils are better preserved than those of the same class at Glen's Falls.

The fossils are the

Atrypa acutirostra,
Atrypa extans,
Atrypa increbescens,
Atrypa modesta,
Atrypa plena.

Bellerophon bilobatus,
Buthotrephis flexuosa,
Buthotrephis succulens.

Capulus auriformis,
Chætetes lycoperdon,
Columnaria alveolata.

Glyptocrinus decadactylus,
Graptolithus ramosus,
Graptolithus scalaris,
Graptolithus sagittarius.

Heterocrinus heterodactylus.

Illænus crassicanda.

Leptæna alternata,
Leptæna fasciata,
Leptæna serica.

Orthoceras junceum,
Orthoceras laqueatum.

Palæophycus rugosus,
Pleurotomaria ambigua.

Retepora incepta,
Retepora gracilis.

Schizocrinus nodosus,
Scyphocrinus heterocostalis,
Stictopora acuta,
Stictopora fenestrata.

GLEN'S FALLS

Is about twenty miles north-east from Saratoga Springs, and about four miles up the stream from Baker's Falls. Extensive quarrying has been done heretofore at this place, which exposed the fossils in great numbers; but at the present time the Paleontologist is mainly limited to the small blocks to be found at low water in the bed of the river. And the fossils in some of these blocks are so highly crystalline that the nice striae of the shells are often destroyed in splitting the stones.

The following specimens are to be found at this place :

Atrypa acutirostra,
Atrypa extans,
Atrypa increbescens,
Atrypa modesta.

Buthotrephis flexuosa,

Buthotrephis succulens,
Bellerophon bilobatus.

Columnaria alveolata,
Calymene senaria.
Delthyrus lynx.
Escharopora recta.
Leptæna alternata,
Leptæna sericea.
Palæophycus simplex,
Poteriocrinus alternata.
Stictopora acuta.
Trinuclius concentricus.

GREENFIELD

Lies about four miles north-west of Saratoga Springs, and one mile north of Miller Hoyt's lime-kiln, and on the east side of the highway leading from Greenfield Centre to the village of Ballston Spa, via Rowland's Mills. Oolites are also found at this place.

SANDY HILL,

Lying between Baker's Falls and Glen's Falls, on the west side of the Hudson river, and a few rods below the ferry, can only be examined when the water is low in the river.

The fossils are the

Nultainia concentrica,
Neirthus becii.
Graptolithus dentatus.

SARATOGA SPRINGS.

In the Railroad cut in the village of Saratoga Springs were found the

Euomphalus uniangulatus.
Pleurotomaria turgida.

SNAKE HILL

Is situated on the east shore of Saratoga lake, and is plainly to be seen from the Lake house; indeed it is the most prominent feature of the eastern shore.

The fossils are the

Heterocrinus grascilis,
Olenus undulostriatus,
Graptolithus bicornis,
Graptolithus pristis.

WATERFORD

Is in the south-east corner of the county, and has the following variety of fossils or specimens :

Ambonychia radiata,	Lyrodesma pulchella,
Bellerophon cancellatus,	Modiolopsis nuculiformis,
Cleidophorus planulatus,	Murchisonia gracilis,
Carinaropsis patelliformis,	Theca triangularis,
Carinaropsis orbiculatus,	Trinucleus concentricus.

MAGNETIC IRON ORE occurs in the primary rocks of this county as an injected mass, or as an intrusive rock. A large body of this ore exists in the mountain south of the confluence of Sacondaga with the Hudson; and about two miles south of Hadley or Rockwell falls. Ten or fifteen veins have been described, and one from five to eight feet wide. When the Porter vein was opened, it was found to increase in width as the rock was penetrated, while the feldspar diminished. The ore is said to make very soft, strong iron, and to be superior even to the Arnold bed. It is quartzy, and yields from thirty to fifty per cent. of iron.

CHRYSOBERYL is found about two miles north of Saratoga Springs, and on the farm of the late John Miller. It occurs in a vein of granite traversing gneiss, and is associated with tourmaline, garnet, apatite, feldspar, and mica, and is found no where else in the state.

CLAY BALLS are found about the shores of Saratoga lake. They are supposed to form around the roots of plants, as they generally have a perforation in which the root of the plant has been sometimes seen. Probably the root absorbs the water and the carbonic acid from

the clay, and rejects the carbonate of lime, which had been previously held in solution by the water and the carbonic acid. This accumulates around the root of the plant, which with the clay becomes after a time an indurated egg-shaped ball.

BOULDERS are rounded masses of rock, of no determinate size, out of place and apparently transported by water, and are supposed to have been brought to their present shape by attrition and atmospheric influences. Those which are found in the valley of the Hudson, are generally thought to have been brought from the primitive rocks, which form the mountain ranges in northern New York. In this county we find these stones in a great variety of forms and sizes, many of them weighing many tons. The largest specimens may be found in the towns of Hadley, Corinth, Greenfield, Galway, and Ballston.

MARL.— Fresh water marl is formed by the decay of successive generations of shells, in the bottom of fresh water lakes and ponds. When, from any cause, these places are raised to a level compatible with the germination of seed, there follows a succession of growth and decay of vegetable matter, which may result in a deposit of peat, and hence it is not unusual to find peat overlying the marl. Marl has not been found very generally in this county. There is a bed of it however, about the outlet of Ballston lake, on the farm of Mr. Irish, which has been used as a fertilizer, and with marked success. It would undoubtedly prove profitable to agriculture, if farmers would use much more of it than they now do,

for the action of the elements on the chemicals generally present in soils, renders the lime soluble, and it is actually carried away.

There is another bed of marl on the farm of Dr. Oliver Brisbin, in the town of Saratoga, which has been but little used as yet, but wherever it has been applied, decidedly beneficial effects have followed.* It has been suspected by geologists, that it may underlie the sandy soils which prevail to so large an extent in this county. But the probability is, that beds of marl will be confined to that part of the county adjacent to the limestone formation, for the water of such region, flowing over the limestone rocks, at last finds its way into the lakes, otherwise sufficient lime would not be supplied to produce a deposite of shells.

Soil is composed of various mineral substances, united in comparatively small proportions with animal and vegetable matter. The mineral parts of soil are composed of the same substances which constitute the mountain rocks, and the mineral masses which form the crust of the earth. The rocks are broken down by degrees, and then acted upon by air and water, by which process they become well adapted to the reception and vegetation of seed generally. The varieties of rocks and mineral masses which exist on the earth and compose its surface, are comparatively small, and may be comprised in the following list, viz: Silica, alumina, magnesia, soda, potassa, and oxyde of iron.

With the predominance of either of the above sub-

* The town of Malta contains beds of marl, one of which is on the farm of the late John P. Talmage.

stances in a given locality, the soil, of course, as well as the character of the vegetables, correspondingly varies.

SILICIOUS SOIL, or that composed principally of silex, is very widely spread over the earth's crust. It is found in quartz, and of course enters largely into the composition of granite, and the various silicates, as serpentine, tumalite, diallage, and hornblende; and when we examine the rocks which compose the mountains to the north and west of the county, and consider the very large proportion of silex which enters into their composition, we are at no loss to account for the origin of the sandy plains which there prevail so extensively.

Where this sand occurs in coarse grains it is much less productive as a soil, than when more comminuted; and the less or greater degree of trituration which the particles have undergone, will determine, in part, the different degrees of productiveness which characterize adjacent sections.

Soils, apparently the same, also differ materially in their degree of productiveness, in consequence of the different amounts of vegetable matter contained in them, and are rendered still less fertile if they occupy elevated land, where water, at a low temperature, saturates the surface. In localities of this description pasturage is poor, and plowed lands are unavailable. In other cases, where clay exists in combination with sand so as to produce a sand loam, very fair farms are developed. This soil prevails in the town of Saratoga Springs, Wilton, Corinth, Hadley, and the west part of Moreau and Northumberland. In a large proportion of Eastern New York,

and generally in fifteen out of twenty counties of the state.

ALUMINOUS, is the variety of soil next in abundance, the base of which is alumina. It is formed by the breaking down of greywacke slates, and shales and in combination with silex, forms a large proportion of the rocks and mineral masses on the earth. The slate rocks crop out on the Ellis Farm two miles south of the springs. From this point they run in a north-east direction to Fort Miller, on the Hudson, and may be seen skirting the sand plains on their eastern border, from the town of Clifton Park to Moreau.

When alumina is in excess, in soils, it makes cold and wet farms, but when combined with silex the clay loam is formed; this with the addition of an ordinary amount of vegetable and animal matter, gives good farming lands; and when to this is added marl, or lime in some form, farming land of the best quality is the result.

This is the composition of the soil along the banks of the Hudson and Mohawk rivers, also about the Saratoga and Ballston lakes, and the creeks in the south-east part of the county. This soil is of considerable depth, and very productive, yielding grass and all the cereals in abundance; and I am told, in districts of this character, strangers, passing by, mistaking pastures for meadows, in the goodness of their hearts, not unfrequently call at the farm-houses, and inform the occupants that their cows or horses are in their *meadows*.

THE CALCAREOUS SOILS, or those in which lime predominates, are the result of the breaking down of the

different forms of carbonate of lime, which exist so abundantly through the world.

THE MAGNESIAN SOIL is that in which magnesia exists, variously combined. This and the soils just before named, prevail in Western New York, and with the addition of gypsum, and large quantities of vegetable and animal matter combined, make up the rich lands of that fertile region.

FERRUGINOUS SOILS are those in which the oxydes of iron prevail.

VEGETABLE PRODUCTIONS.

To the botanist this whole country is full of interest; indeed, it may perhaps with truth be asserted, that every flowering plant in the country to be found in the latitude of this county, has its representative within its limits.

From an acquaintance with the nature and variety of the soils which prevail in the county, it might be readily inferred, that a correspondent variety would be found in its vegetable products. This is observable in the forest timber and smaller plants.

In the eastern and southern portions of the county, apples, and peaches, have once abounded; but now, the varieties are few, and the fruit is not so rich as formerly.

Cherries.— Every variety succeeds well.

Pears succeed remarkably well, in nearly every variety. In the central portion, the small fruits, as strawberries, raspberries, whortleberries, and blackberries, are indigenous and abundant, and will bear high cultivation.

Several varieties of wild grapes highly improved by the process of cultivation are abundant in the sandy portion of the county. Maples, hickories, elms, oaks, butternuts, chestnuts, beeches, birches, basswoods, aspens, black and white ash, black cherry, and crab apples, are plenty in the eastern part of the county.

The central portion has been, and is now remarkable for the number, beauty, and variety of its evergreens. The species of these most common, are white and yellow pines, yellow, white, and red cedar, double spruce, balsam, and hemlock. The sand plains on the central part of the flat, were once covered with a heavy growth of these fine trees; but the hand of improvement, *so called*, has swept them recklessly away, and unless some care is taken, it may be that before very long, our beautiful groves will all disappear, and the charms of our winter landscapes will all be gone. It is not very long since, when expostulating with a land-holder for cutting away every trace of evergreen within view of his residence, we received the cool reply, that they were "*nothing but pines.*" And so those stately trees, old tenants of the forest, which had weathered the storm and glinted the sunshine, and braced themselves against the winds of centuries, were felled and riven by the axe of the woodman without a single thought of regret, or a single sentiment of remorse.

Grasses.— Those parts of the county lying along the banks of the Hudson and Mohawk rivers, the Kayaderosseras creek, and the shores of the lakes, are well adapted to the growth of grasses.

Timothy is one of the most important grasses for fodder, and is abundantly produced in the above mentioned parts of the county.

Clover grows luxuriantly in most parts of the county. The red is much used to redeem farms which have been too much worn by want of a proper rotation of crops. The white clover is indigenous. The fox tail (Alopecearus practensis), and red top, are the most cultivated for hay.

Grains.— Rye is much cultivated, and the sandy portions of the county are particularly well adapted to the growth of this esculent grain, which when ground, and combined with corn meal, makes a very healthy and nutritious bread. Two varieties, the winter and spring rye, are cultivated.

Wheat.— This favorite grain was much cultivated in the county in early times, but in later years it has been so much injured by the weevil, that it is but rarely sown. The spring wheat is less likely to be injured by the insects than the winter wheat, but is not considered so good for bread, and is therefore but little cultivated at the present time; and the inhabitants mainly depend upon the western country for their wheat flour.

Oats are much cultivated, and may be said to be one of the staple crops. They are mainly used as feed for horses.

Maize is the most important grain crop raised, and every farmer produces more or less of it, and it constitutes quite a large proportion of the bread, in the least productive parts of the county.

Potato.— This plant is well adapted to the climate and soil of the county. Large crops of it are cultivated along the canals and railroads, and a great number of bushels every year find their way to New York city. The potato enters largely into the daily food of all classes of the people, and is one of the most important crops.

Buckwheat is cultivated to some extent.

Beans grow well, and it is to be regretted that they are not more cultivated and eaten by the laboring classes almost universally.

Most of the county is well adapted to horticulture; and all the garden vegetables usually cultivated in the same latitude flourish in the soils of this region. It is to be regretted, there is so much negligence on the part of land-holders in regard to private gardens. An increased amount and variety of vegetables would add greatly to the comfort of the household, and a little care in the cultivation of flowers and ornamental shrubs, would furnish healthful and pleasant employment to the younger members of the family, and greatly improve their habits of observation.

DRIVES ABOUT SARATOGA.

The drive most commonly selected is to Saratoga lake. This is a beautiful sheet of water, and lies four miles east of the village. The lake is eight miles long and two and a half wide. Its main inlet is the Kayaderosseras creek, which flows into the lake from the west. The water of the lake passes through Fish creek and unites with that of the Hudson river, at Schuyler-

ville. The western shore of the lake near its outlet, rises into a beautiful bluff of fifty feet, and on the top of this bluff is the Lake house, from the piazza of which may be had a fine view of the lake and its eastern shore, with Snake hill.

The Lake House is a favorite eating place, where game dinners are served up in the most approved style. Persons fond of angling, rowing, or sailing, can here enjoy their favorite pastime, on one of the most beautiful lakes in the country. The bait-fish and the boats are always in waiting on the shore, and cooks are in readiness to serve up, at short notice, any fish which may chance to be caught.

CHAPMAN'S HILL.—The angling and sailing may be dispensed with, and the drive be extended across the bridge, along the lake shore for a mile, where a turn to the left up the hill, will soon bring one to CHAPMAN'S HILL, from the top of which, one hundred and eighty-eight feet above the level of the lake, a beautiful western landscape is spread before the observer. The lake is almost under his feet, a mirrored surface of twenty miles square. The western shore of the lake rises rapidly to the table-land, which spreads away to the west, a distance of ten or twelve miles, and is merged in the base of the Kayaderosseras mountain, giving a view from forty to fifty miles in extent. Its surface is beautifully variegated with fallow, meadow, and woodland, and the tenements and out buildings of the farmers are thickly scattered and reflect, each for itself, a few sunbeams, making many bright spots in the landscape;

while in the background, the bold range of the Kayaderosseras mountain rises to the height of two thousand feet above the level of tide-water, and stretches along the horizon for fifty or sixty miles. The mountain rises out of the table-land, as its base, and lifts up its summit into the sky, while the distance tints its peak with a most exquisite azure.

WAGMAN'S HILL.— By continuing the drive for about three miles, through a rich farming country, a view of WAGMAN'S HILL is obtained. This point is fifty-seven feet higher than Chapman's Hill, and commands a more extended panoramic view. The Adirondac mountains bound the river to the extreme north, the Kayaderosseras spreading a deep blue border along the western horizon, the Helderberg and the Catskill skirts the distant south, while the Green mountain chain borders the eastern view, each subdued and softened by distance, as the tops blend with the sky. This very beautiful view as it spreads away to the north-west and to the south-west, places within the range of the eye, one thousand square miles of farming lands, with waving grain and deep shaded meadows; the mountain forest, and the wood lot of the farmer, casting a cool shade across the fallow field, as though to protect it from the scorching rays of a summer's sun, while the Fish creek, winding its way to the Hudson, and increased by many a mountain stream, enlivens and beautifies the whole landscape. This hill is seven miles from town, to which a party can go and return by Stafford's bridge and Avery's Lake house, in ample time for dinner.

HAGERTY HILL, six miles north of Saratoga Springs, and nearly on the plank road leading from the village to Luzerne on the Hudson river, is about half a mile due west from Greenfield Centre, and commands a western, southern, and eastern view.* On the west rises the bold range of the Kayaderosseras mountain, extending far away to the north, and to the south is spread out a wide plain, covered with evergreens, and bounded by high and broken ranges of mountain land south of the Mohawk river, while to the east, a still more beautiful landscape greets the eye.

Almost under the feet and spreading away to the east, lies a deep basin, thickly dotted over with farms, woodland, villages and lakes, and margined on its extreme east by the Green mountains. This is a beautiful drive of six miles out, and on returning to town, the road east through Greenville Centre, will give a partial, yet very pretty view from Meeting House hill, midway between Greenfield Centre and St. John's Corners. At St. John's the right hand road which leading over the HEWIT and WESTCOTT HILLS is to be taken. These hills give quite pretty views of distant mountain scenery, and make a little variety to the drive, without materially increasing the distance.

WARING HILL.— The boldest and most imposing view within a convenient drive from the springs is Waring hill, on the road to MOUNT PLEASANT. Here within the distance of sixteen miles, an elevation is attained of two thousand feet above tide-water, and one of the high-

* This point is eight hundred feet above tide water.

est points of land between the valley of the Hudson and Lake Ontario.

From this point of observation all the other views which have been previously noticed, come within the range of the observer's eye; and the far distant tops of the mountains as they gradually pass into the azure sky, make a charming landscape bordering. This view includes the villages of Saratoga, Ballston Spa, Schenectady, Waterford, Mechanicsville, Schuylerville, Saratoga lake, Fish creek, Owl pond, Ballston lake and Round lake; together with the winding stream of Kayaderosseras, from its source in the sides of the mountain to its entrance into Saratoga lake, and the whole course of the Hudson from its confluence with the Sacandaga, until it is lost in the midst of the Catskill mountains. These all lie within the range of the eye of the observer as he stands on the top of Waring hill. Here, also, may be traced the wide-spread valley, as it lies between the Kayaderosseras mountain on the west, the Green mountains on the east, and the Palmerton on the north, dotted with woodland and cultivated farms. And as the clouds occasionally pass over the landscape casting their shadow here and there, on the meadow, the fallow and the grove, an additional beauty is added to all, by the mellow blending of the varied tints. And when autumn comes and spreads its sear and yellow leaf and tinges the maple foliage with its high colorings, the contrast with our abundant evergreen lends to our wild mountain scenery a gorgeous beauty which is rarely equaled, and but seldom if ever surpassed.

This last mentioned view is obtained by a drive up

the Hadley plank road, of about eight miles, thence along the Mount Pleasant plank-road nearly up to the foot of Waring hill, six miles, thence to the right by a mountain road for half a mile. At this point the carriages are to be left, and Waring hill of three hundred feet is to be ascended on foot. The excursion may be made between the breakfast and dinner hours, with great ease. A good glass is important, for many of the villages are not to be seen distinctly by the naked eye.

CORINTH FALLS.— Another drive is CORINTH FALLS. These falls are fifteen miles north of Saratoga Springs, in the Hudson river, about one mile from Jessup's Landing. At this village is a comfortable public house, and also a convenient place to dine. In order to view the falls from the Luzerne side, it is necessary to cross the river at the landing, and then drive to the top of the bluff, which rises one hundred feet above the falls, or to the bank of the river below them. The rapids in the river begin about a mile above the cataract, and the stream narrows as it approaches the precipice, to fifty feet. Through this narrow channel the water of the stream is driven one hundred and fifty feet with great force, where it suddenly widens to about one hundred feet, and the water appears to fall into a deep chasm, from which it ascends in billows of foam, and immediately makes its last leap over a precipice of more than sixty feet.* The deep gorge above them affords no opportunity for building, and the high bluff above the

* Since this work has been in type, a company from New York has begun to use the stream for manufacturing purposes.

cataract is so situated, that any other than private residences would be impracticable. The place is in nearly its native wildness. The high banks upon either side of the river are covered with pine, cedar and hemlock; and the rocks with a variety of moss. The lover of the picturesque will find himself well repaid for his time and fatigue, by a few hours' contemplation of the wild beauty and lovely solitude of this fine cataract.

ELLIS SPRING.— Another drive is down the Ballston road two miles, to the Ellis Spring. This spring is near the railroad, a few rods from where the Ballston highway crosses the Saratoga and Schenectady railroad, and on the west slope of the hill.

This spring is an acidulous carbonated water, and is in the mineral range. The water, unlike those at Saratoga, issues from the *slate rock*.

From this spring, take a westerly course across the pond up to CADY HILL. At CADY HILL take the right hand road, and drive about two miles following the bank of a small stream, thickly wooded along its whole length.

BENEDICT'S SULPHUR SPRING.— Just before reaching a pond, a pair of bars closes the way to a large barren field, a beautiful grove of evergreens skirting on the left of the pathway. After twenty or thirty rods the path turns into the grove and leads the observer to the top of a bluff about forty feet in height. At the base of this bluff is a mineral spring strongly charged with sulphur, known as Rowland's or Benedict's Spring. This place is susceptible of great improvements, and might be made

attractive. Across the ravine is a marble quarry which has been worked to a considerable extent.

Then turn for half a mile to the right and continue past two roads bearing off to the east, and take the third road, which leads to the Hadley plank-road at Splinterville. Just before reaching the last mentioned road, a limestone formation is passed, unique in appearance. The surface of the rocks is formed into nearly concentric rings, which vary in size from an inch to eighteen inches in diameter. This agate appearance is not only found in portions of rock in the mass, but also in detached portions of various sizes. Near this oolitic formation, is MILLER HOYT'S LIME KILN, which the Saratoga Springs is mainly supplied with this important article. On reaching the plank-road at SPLINTERVILLE, the Greenfield reservoir may be seen about forty or fifty rods in an easterly direction from the junction of the two roads. From this reservoir fresh water is brought in conduits to supplythe village. Two miles farther east the plank-road terminates in Broadway at the Columbian hotel. The whole circuit making a drive of about seven or eight miles.

STILES'S HILL.— Another pleasant excursion is to be had, by a drive of a few miles along the east base of the Palmertown mountain, to ELI STILES'S, which commands a beautiful landscape, extending fifty or sixty miles down the Mohawk and Hudson rivers. To the east, is the mountain range, which rises up so imposingly between the Hudson and Connecticut valleys; while on the north are the Green mountains of Vermont. This is

our best view which we have of the Hudson river valley, north of its confluence with the Mohawk, and commands the wide plains, which are spread out between the Kayaderosseras mountain on the west, and the high range of land lying east of the Hudson river. These plains were covered with a noble growth of white and yellow pines, and other evergreens, before the woodman's axe had rudely cut them away, but now they are nearly shorn of their beauty, with only here and there a clump of trees to vary the flat barren sand plain.

The different distances of the mountain peaks produce all the variety of coloring which so greatly enhances the interest of mountain views.

There are some large boulders to be seen on the top of Stiles's hill, which are worthy of an examination, having probably been brought from the primitive mountains farther to the north.

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